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Notes on Mediterranean Theridiidae (Araneae) – II

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Abstract

Taxonomic and faunistic amendments are provided for 15 species and one subspecies of comb-footed spiders (Theridiidae) of the Mediterranean region, in the genera *Anatolidion*, *Episinus*, *Heterotheridion*, *Theridion* and *Theridula*. The following taxonomic changes are proposed: *Anatolidion osmani* Wunderlich, 2008 and *Theridion crinigerum* Simon, 1881 are synonymised with *T. gentile* Simon, 1881, making it the type species of the monotypic genus *Anatolidion* Wunderlich, 2008. *Episinus albescens* Denis, 1965 is synonymised with *E. algiricus* Lucas, 1846, *Theridion xinjiangense* (Hu & Wu, 1989) with *Heterotheridion nigrovariegatum* (Simon, 1873). *Theridion aelleni* Hubert, 1970 is removed from synonymy of *Theridion spinitarse* O. P.-Cambridge, 1876 and transferred to *Theridula*. The recent transfer of *Theridion pinicola* Simon, 1873 and *T. genistae* Simon, 1873 into *Paidiscura* has to be rejected. *Theridion genistae turanicum* Charitonov, 1946 from Uzbekistan is raised to species level. New faunistic records are presented for *Theridion pinicola* from North Africa, *Anatolidion gentile*, *Theridion genistae* and *T. hemerobium* from Greece. Several poorly known (sub-)species are redescribed: *Anatolidion gentile*, *Episinus maculipes numidicus* Kulczyński, 1905, *Theridion genistae*, *T. glaucinum* Simon, 1881, *T. musivum* Simon, 1873, *T. pinicola*, *T. pyrenaeum* Denis, 1944, *T. semitinctum* Simon, 1914 and *T. spinitarse* O. P.-Cambridge, 1876.

Keywords

Theridiidae, taxonomy, synonymy, faunistics, Mediterranean region, *Anatolidion*, *Episinus*, *Heterotheridion*, *Theridion*, *Theridula*

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Introduction*

In the Mediterranean region spider taxonomy has been far less thoroughly considered and revised than in central and northern European countries, mainly owing to a lack of continuous research (Thaler 2000). Similar deficiencies in the current knowledge of spider diversity are also still substantial among the Theridiidae (Knoflach and Thaler 2000). About half of the roughly 280 comb-footed spider species described from Europe and the Mediterranean, including North Africa and Macaronesia, are known from one sex only and many of them have not been found again since their first discovery (Knoflach and Thaler 2000). Further problems arise in the long list of "species inquirendae", which are difficult to interpret. As many theridiids show large areas of distribution, numerous synonyms may be expected. This contribution is the continuation of a stepwise approach and concept to improve taxonomic and faunistic insights on comb-footed spiders in this region. We re-examined miscellaneous representatives of the genera *Anatolidion*, *Episinus*, *Heterotheridion*, *Theridion* and *Theridula*, with most species having been described by the French arachnologists Eugène Simon, Jacques Denis and Hippolyte Lucas, and we present new records and comparative remarks. As major taxonomic changes, four new synonymies are here proposed and a previous synonym is revalidated.

Material and methods

Specimens were examined using a Leica Wild M8 stereoscopic microscope with a micrometer eyepiece. Male and female genitalia were dissected and studied as temporary mounts by submerging them in glycerine and Hoyer's compound solution (Kraus 1984) on half-covered slides under a Wild M20 microscope with a drawing tube. Living spiders were photographed with a Nikon F3, Medical-Nikkor 120 mm lens, ring flash and a teleconverter. All measurements are in mm.

Abbreviations: C – conductor, Cy – cymbium, E – embolus, ETA – extra tegular apophysis, S – subtegulum, T – tegulum, MA – median apophysis, TTA – theridiid tegular apophysis (nomenclature of male palp sensu Agnarsson 2004 and Agnarsson et al. 2007). Species are listed in alphabetical order.

Depository and museum abbreviations: CM – Collection C. Muster [private collection], CTh – Collection Thaler and Knoflach [private collection], MHNG – Muséum d'Histoire naturelle Genève, MHNP – Muséum d'Histoire naturelle Paris, NHMB – Naturhistorisches Museum Basel, NMW – Naturhistorisches Museum Wien, SMF – Senckenberg Museum, Frankfurt am Main.

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* We cordially dedicate this study to Dr. Christo Deltshev on the occasion of his 70th birthday.

Taxonomic part

***Anatolidion gentile* (Simon, 1881)**
Figs 1-9

Theridion gentile Simon, 1881: 106, male, type locality: Corsica.
Theridion crinigerum Simon, 1881: 72, female, type locality: Corsica, **syn. n.**
Theridion crinigerum: – Dalmas 1922: 86, male, Isola del Giglio.
Anatolidion osmani Wunderlich, 2008: 385, figs 491-495, photo 352, male, type locality: Anatolia, **syn. n.**

Detailed description. Wunderlich (2008, sub *Anatolidion osmani* Wunderlich, 2008, male).

Synonymy. Recent syntopically collected males and females of this striking theridiid from Chios allow matching of the sexes on the one hand, but also synonymy of Simon's *Theridion crinigerum*, as well as the recently described species *Anatolidion osmani* Wunderlich, 2008. According to Simon's material, *Theridion crinigerum* and *T. gentile*, which since their description have been known from one sex only, can clearly be assigned as conspecific with the Greek specimens, and thus are considered here as synonyms. As both species were described in the same year and the same work it is in compliance with the principle of the first reviser (ICZN 24.2, International Commission on Zoological Nomenclature, http://www.iczn.org/iczn/index.jsp) for our decision to determine precedence, which is in favour of *gentile*. The genus created by Wunderlich (2008) cannot be appropriately discussed here. *Anatolidion gentile*, which now becomes the type species of the monotypic genus *Anatolidion* Wunderlich, 2008, appears to share some features with the genus *Neottiura*, such as voluminous palps, a non-bulging epigaster, as well as an elevated clypeus, so that the cheliceral apodeme is far distant from the anterior eyes.

Material examined. Morocco: 1 ♀ (MHNP AR 2253 sub *Theridion crinigerum*). **Algeria:** "Provence; Biskra; Tlemcen; Alger", 1 ♂, subadult ♂ (shortly before maturation) 5 subadult ♂, 22 juveniles (MHNP AR 2250 sub *Theridion gentile*). **Greece:** Chios, Volissos oaks, under oak logs in wood, 1 ♀ (CTh), 12.5.2006, leg. R. Snazell, swept flowers and grass between oaks, 2 ♂ (CTh), 12.5.2006, leg. A. Russell-Smith.

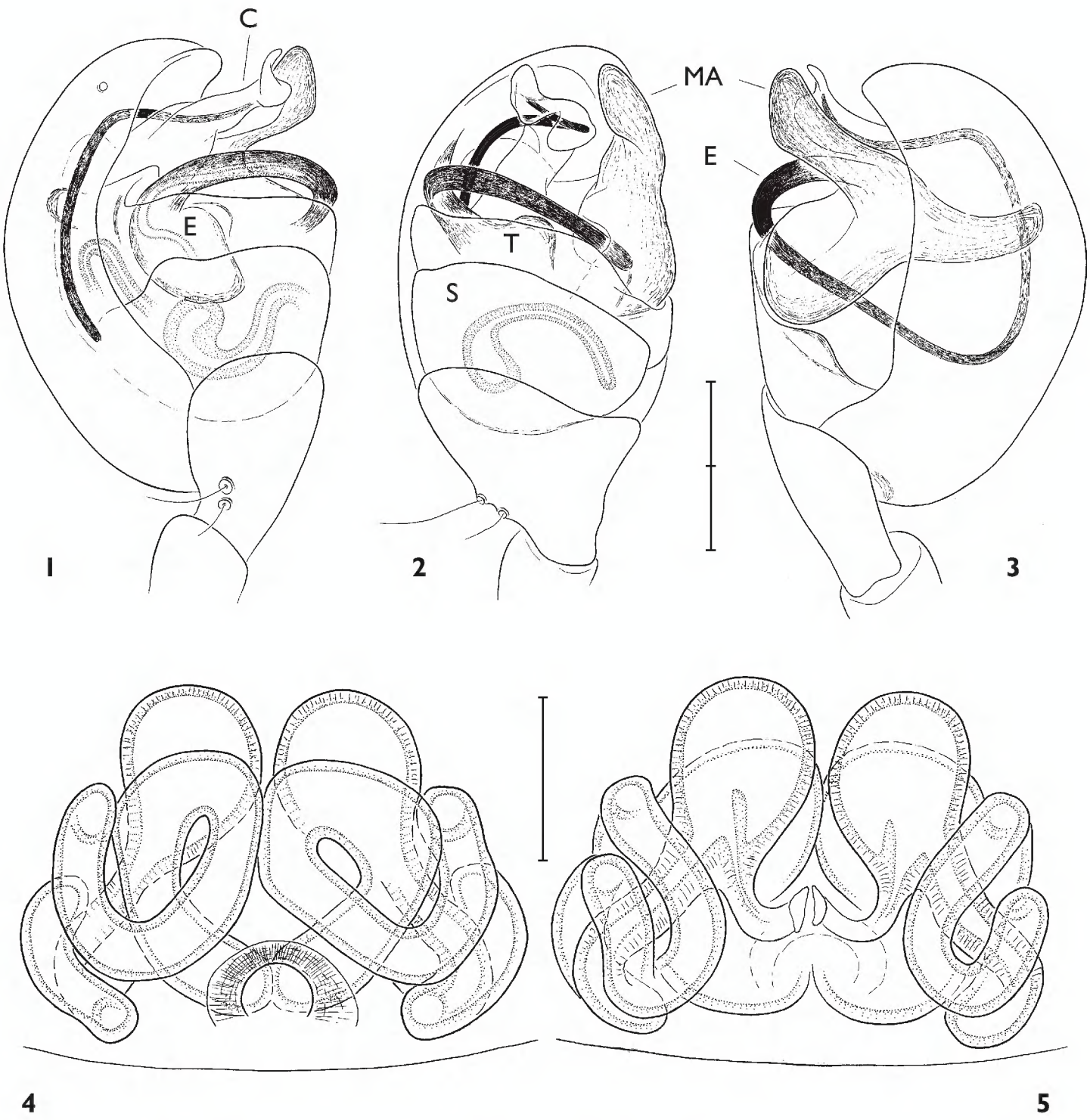
Measurements. Male (n=3, min-max): Total length 1.6-1.9, carapace length 0.7-0.8, width 0.7-0.8, length femur I 0.9-1.0, tibia I 0.6-0.8 mm. Femur of male palp 0.4-0.5 mm long. Female (n=2, min-max): Total length 2.2-2.5, carapace length 0.8-0.9, width 0.8, length femur I 0.8-0.9, tibia I 0.6 mm.

Somatic features, colouration (Figs 6-9). Carapace as long as wide, rather high. Eye region of male raised, clypeus projecting. Cheliceral apodeme quite distant from anterior eyes. Male epigaster not protruding. Carapace dark brown, with cephalic and lateral diffused dark areas. Sternum dark brown. Legs uniformly brown or with tibiae apically darkened, in males rather faint. Abdomen with blackish areas of various extent on brownish background, males considerably darker. Abdominal hairs long and

strong, as indicated by the naming of Simon's female as *T. crinigerum*. For further details see Simon (1881) and Wunderlich (2008).

Surprisingly, Dalmas (1922: 87, sub *T. crinigerum*) mentions an apical spur on femur IV in the male "L'éperon apical du femur IV du mâle est une particularité très remarquable de cette espèce.". This particular spur was not visible in the males examined and was not mentioned by Simon (1881: 107).

Male palp (Figs 1-3). Palp rather large (Fig. 7), femur long (see measurements) and slender. Tibia likewise well developed, with two retrolateral trichobothria, distinctly tapering at its base. Base about 0.3 width of distal rim in ventral view (Fig. 2). Cymbium voluminous and rounded. Embolus forms a conspicuous, heavily scle-

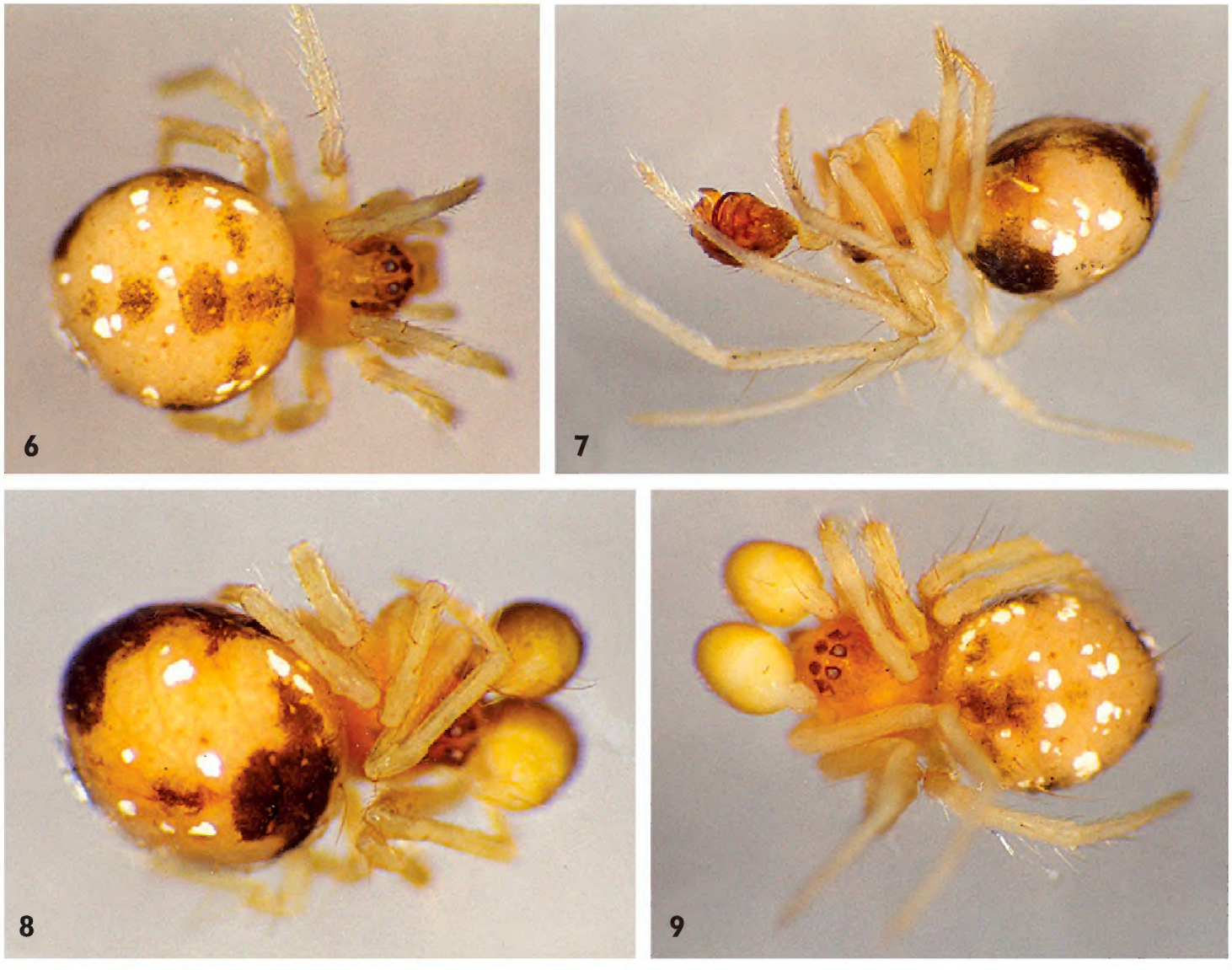


Figures 1-5. *Theridion gentile* Simon from Algeria (MHNP AR 2250; **1-3**) and Morocco (**4-5**). Male palp, retrolateral (**1**), ventral (**2**), prolateral view (**3**). Epigynum/vulva, ventral (**4**), dorsal view (**5**). **1-3** and **4-5** drawn at same scale. Scale lines: 0.20 mm (**1-3**), 0.10 mm (**4-5**).

rotised spiral (Figs 1-3), as described by Simon (1881: 107) "bulbe volumineux, … pourvu d'un très fin stylum circulaire, …" and by Dalmas (1922: 86) "...un fort style roulé en deux spires dans un plan perpendiculaire au tarse". The conductor is a membranous, lobed outgrowth, only its distal part enclosing the embolus. Median apophysis furcate, Y-shaped. Apparently, a second tegular apophysis is missing (see fig. 495 in Wunderlich 2008).

Epigynum/vulva (Figs 4-5). Epigynal cavity small and round, with anterior margin sclerotised (Fig. 4). Copulatory ducts rather wide, ca. 0.8-0.9 mm long, running in several loops, winding in several directions and around each other, proximal coil overlapping receptacles posteriorly (Figs 4-5). Lumen narrows with last coil towards entrance into receptacula seminis (Fig. 5).

Distribution. This little-known species is apparently widespread in the Mediterranean, but records are scattered: Algeria, Morocco, Corsica (Simon 1881, 1914), Italy (Toscana, Isola del Giglio, see Dalmas 1922, sub *T. crinigerum*; Firenze, Villa Mercatale, see Caporiacco 1923, sub *T. gentile*), Greece and Turkey (Wunderlich 2008). Interestingly, the report of Caporiacco (1923) concerns a single female of *T. gentile*, which at that time and until now was known from the male only.



Figures 6-9. *Theridion gentile* Simon from Algeria (MHNP AR 2250). Habitus of specimens preserved in alcohol. Juvenile female (**6**), adult male (**7**), subadult male (**8**, **9**). Photos: B. Knoflach.

Episinus algiricus Lucas, 1846

Figs 10-13, 15-17, 22, 25-26

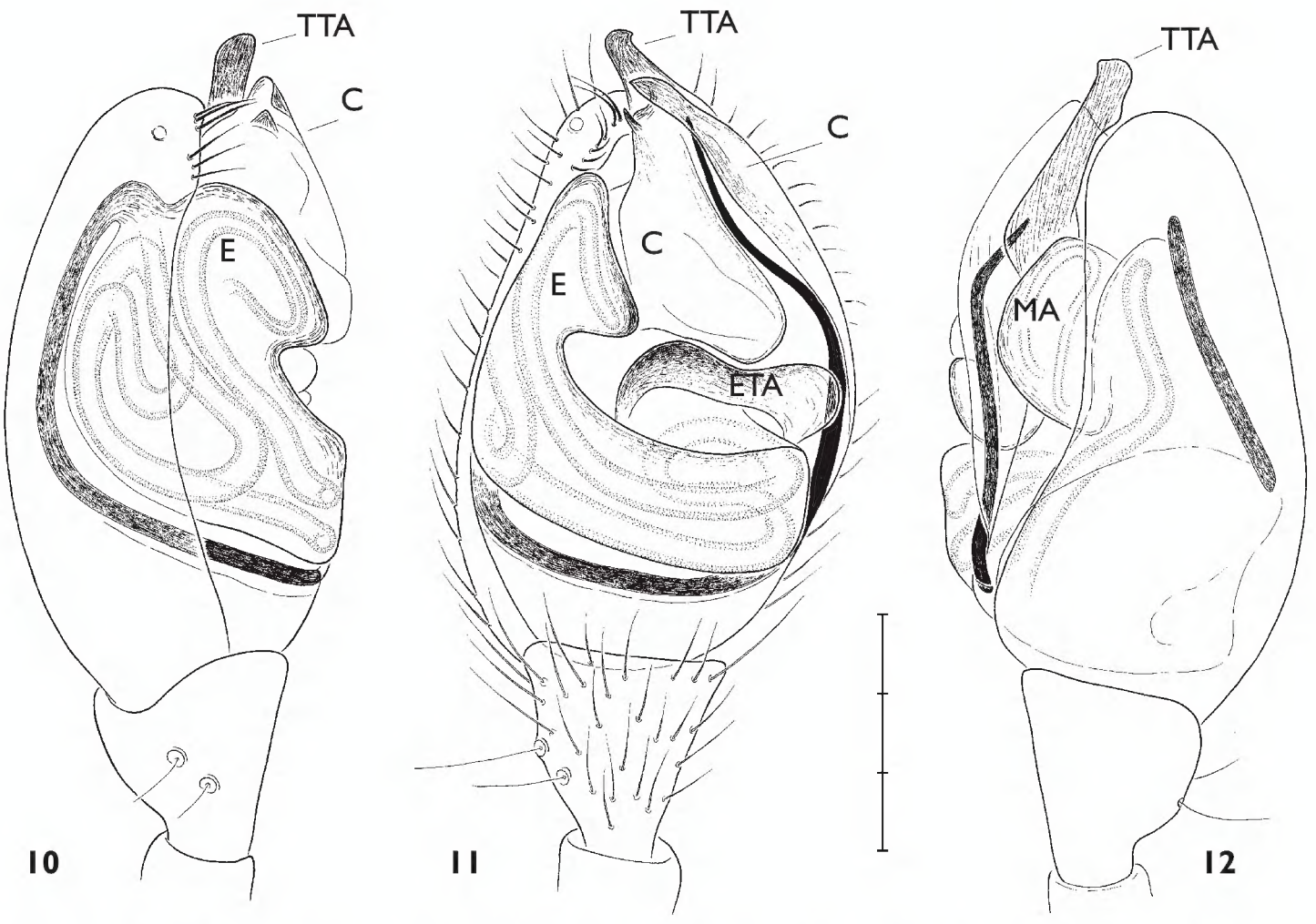
Episinus algiricus Lucas, 1846: 269, fig. 11, pl. 17, subadult male, type region: Algeria, not examined.

Episinus albescens Denis, 1965: 611, figs 1-3, female, holotype from Landes, France, in MHNP, examined, **syn. n.**

Description, identification. Kulczyński (1905), Denis (1965; sub *E. albescens*, female), Knoflach and Thaler (2000, female). Species name *algiricus* as in original description (see Lucas 1846: 269).

Synonymy. The type specimen (female) of *Episinus albescens*, which is in rather poor condition, allows a clear synonymisation according to the epigynal/vulval characters (Figs 15-16). Shape and size of epigynal cavity and receptacula agree well with *E. algiricus*. Also colour pattern and the abdominal shape figured by Denis (1965) support this interpretation. *E. albescens* has not been recorded since its description. The type locality in Landes lies within the distribution area of *E. algiricus*.

Material examined. France: Var, Cavalaire, 1 ♂ (MHNP AR 2198, sub *Episinus truncatus*). Menton, 1 ♂ (MHNP AR 2184), 22.5.1915, E. Simon. "Gallia" without exact locality, 2 ♂, 6 ♀ 1 juvenile (MHNP AR 2196). Landes, surroundings of Dax, 1 ♀,



Figures 10-12. *Episinus algiricus* Lucas from France, Menton. Male palp, retrolateral (**10**), ventral (**11**), prolateral view (**12**). All figures drawn at same scale. Scale line: 0.30 mm.

August 1962, leg. Schilt (Denis 1965; type of *E. albescens*; faded and shrivelled; MHNP). Corse, Evisa, 1 ♀ (MHNP AR 2206 sub *E. angulatus*). **Italy:** Sardinia, Ogliastra, W Baunei, 718 m, 40°06.319' N, 09°34.867' E, 1 ♂ (CTh), 2.6.2003, beating from *Quercus*, leg. B. Knoflach & K. Thaler [Th-443 Sa03/2]. Baunei/Dorgali, close to branch-off to Codula di Luna, 635 m, 40°05.791' N, 09°33.158' E, 1 ♀ (CTh), 5.6.2003, pasture plateau, beating from *Cistus*, leg. B. Knoflach and K. Thaler [Th-455 Sa03/14]. E Dorgali, above Cala Gonone, 220 m, 40°16.290' N, 09°36.641' E, 1 ♀ (CTh), 5.6.2003, beating in oak forest with rocky, bare ground, leg. B. Knoflach and K. Thaler [Th-458 Sa03/17]. **Tunisia:** Monastir, salt marsh near airport, 35°45'N 10°47'E, 1 ♂ (CM), 27.4.2007, from scrub, leg. C. Muster. **Algeria:** "Forêt de Zonagha", 1 ♀, 1 juvenile (MHNP).

Measurements. Males (n=5, min-max): Total length 2.9-4.2, carapace length 1.2-1.6, width 1.0-1.4, length femur I 3.4-4.2, tibia I 2.8-3.9 mm. Females (n=5, min-max): Total length 4.2-5.0, carapace length 1.5-1.6, width 1.2-1.4, length femur I 2.5-2.8, tibia I 2.1-2.4 mm. Prosoma smaller than in *E. maculipes* (see also Kulczyński 1905), but male legs comparatively longer (Fig. 22).

Somatic features, colouration (Figs 22, 25-26). Habitus, colour and pattern similar to *E. maculipes*. Sternum dark, its light median stripe narrower than in *E. maculipes*, sometimes even missing. Carapace with brown median band and reticulate pattern at margins. These and leg markings more diffuse than in *E. maculipes*. Venter and epigaster usually dark or greyish.

Male palp (Figs 10-12). Theridiid tegular apophysis (= TA 2 in Knoflach and Thaler 2000) of characteristic shape, markedly projecting beyond conductor and cymbium (TTA in Figs 10-12). Conductor forming two small tips, retrolateral one tooth-like (Fig. 11). Palp morphology as in other congeners: embolus well developed, containing numerous loops of sperm duct, partially guided by a large conductor, three apophyses present (nomenclature of median apophysis, theridiid tegular apophysis and extra tegular apophysis according to Agnarsson et al. 2007), tibia with one dorsal and two retrolateral trichobothria, cymbium with two distal groups of setae. Palp altogether smaller than in *E. maculipes* (Figs 22 vs. 21; see also Kulczyński 1905), in ventral view 0.4-0.5 mm broad, 0.7-0.8 mm long (distance between distal rim of tibia and tip of cymbium). Tibia as wide as long (Fig. 11), see also Simon (1914).

Epigynum/vulva (Figs 13, 15-17). Epigynal cavity longer than wide, covering proximal part of receptacula (Figs 13, 17), without median septum. Cavity 0.19-0.21 mm wide, its posterior margin distinct. Receptacula seminis small as compared with *E. maculipes*, and less spherical. The uncertain assignment of *E. algiricus* females in Knoflach and Thaler (2000) can be confirmed here.

Distribution. *Episinus algiricus* is apparently confined to the western Mediterranean. Several records come from North Africa, Algeria (Lucas 1846; Simon 1914; Denis 1937), Tunisia (Simon 1914) and Morocco (Simon 1873a), and from south-west Europe, Portugal (Bacelar 1927; Cardoso 2009), Spain (Simon 1873a, 1914), France (Simon 1914; Denis 1934, 1964, 1965, 1966; Soyer 1973) including Corsica (Simon 1873a; sub *E. truncatus* Walckenaer, 1809), and Italy (Sardinia), see also Knoflach and Thaler (2000). Sympatric occurrence with *E. maculipes* seems to be evident from a few

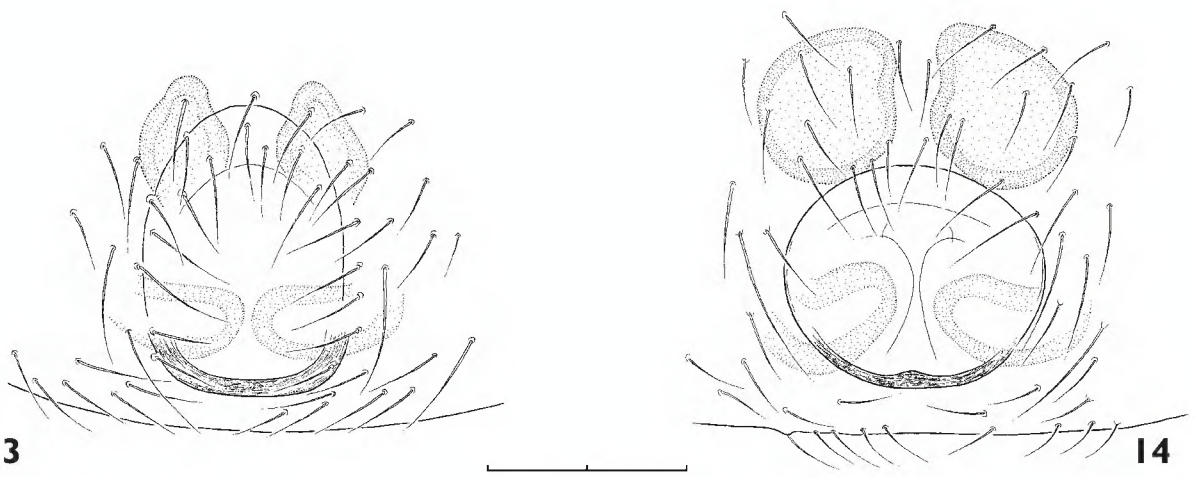
localities only, e.g. Vendée, Longeville (Denis 1964, 1966). Among the present records from Sardinia both species were found at least not far apart.

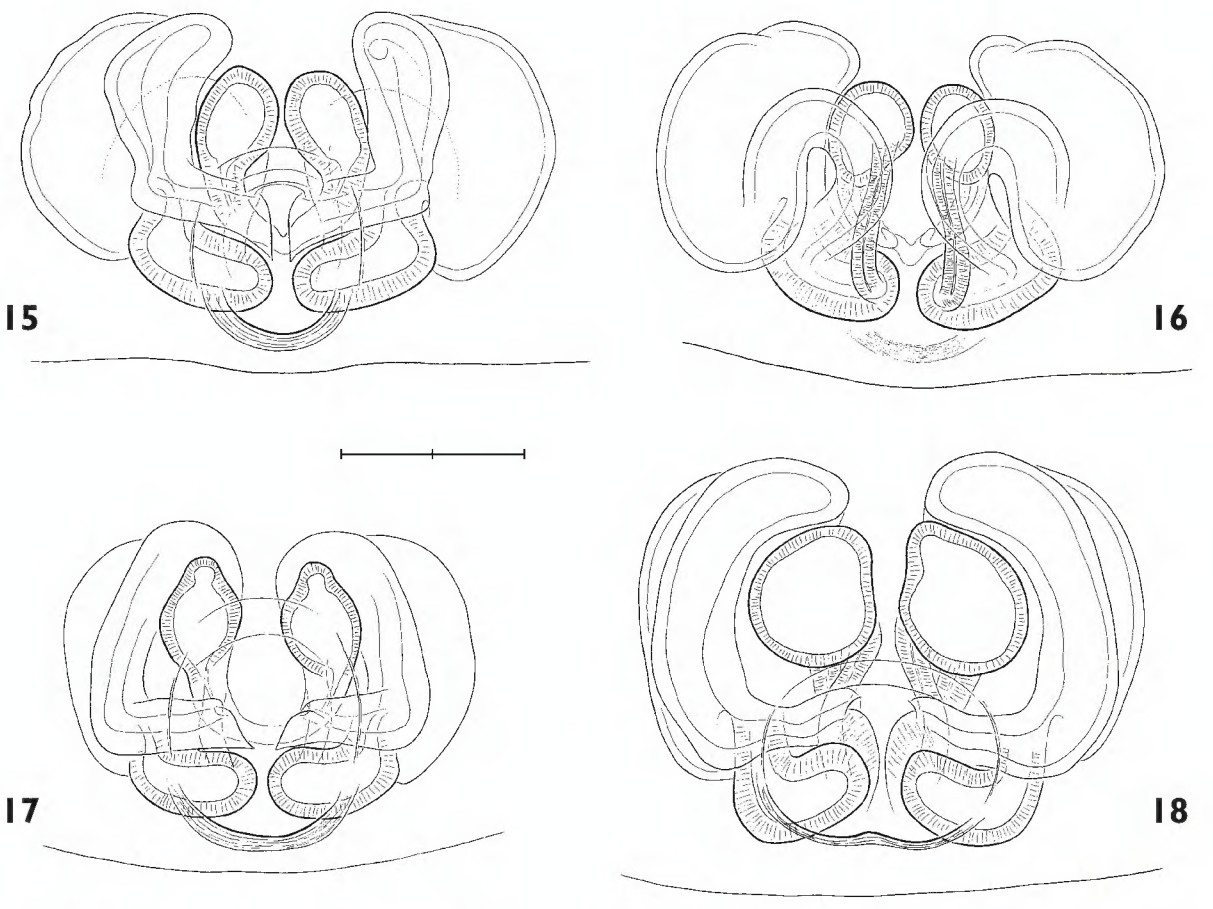
Episinus maculipes Cavanna, 1876

Figs 14, 18, 21, 23, 24

Description, identification. Kulczyński (1905), Brignoli (1967), Locket et al. (1974), Hillyard (1983), Roberts (1995), Knoflach and Thaler (2000), Agnarsson (2004).

Material examined. France: "Gallia" without exact locality, 1 ♀ (MHNP AR 2196, sub *Episinus algiricus,* together with specimens of *E. algiricus*). Idem, 8 ♂ 17 ♀



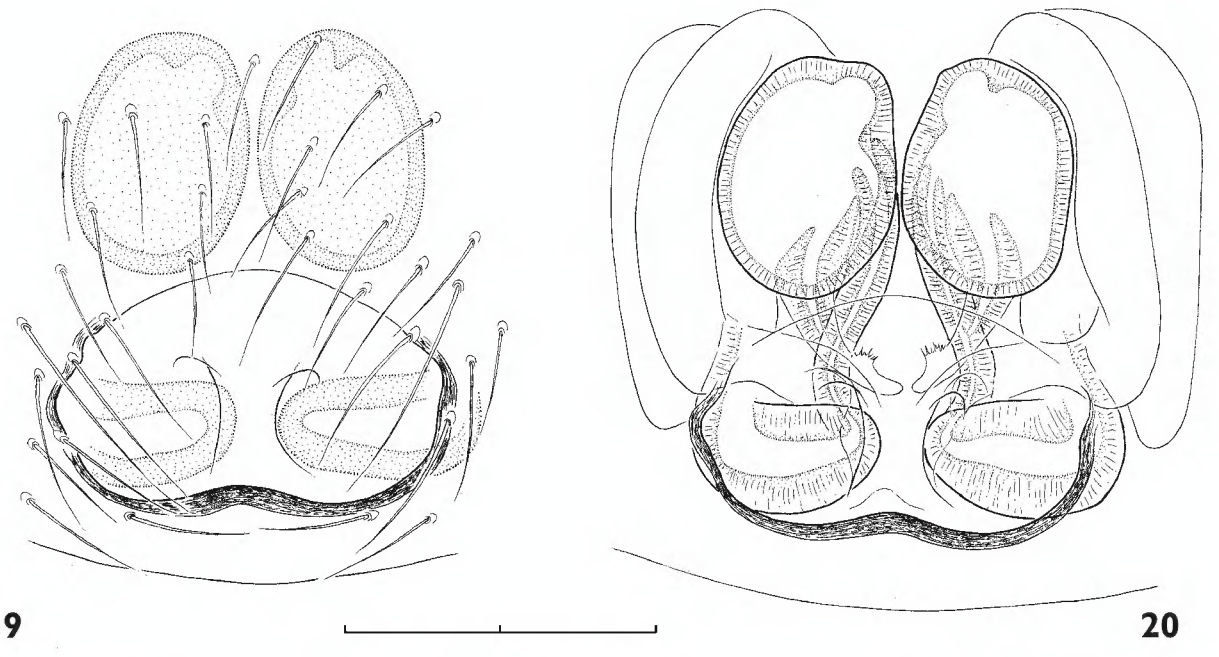


Figures 13-18. *Episinus algiricus* Lucas (**13**, **15**, **16**, **17**) from Gallia (MHNP AR 2196) (**13**, **17**) and France: Landes (**15**, **16**; type of *E. albescens* Denis). *E. maculipes* Cavanna (**14**, **18**) from Gallia (MHNP AR 2196, sub *E. algiricus*). Epigynum ventral (**13-14**), epigynum/vulva, ventral (**15**, **17-18**), dorsal view (**16**). All figures drawn at same scale. Scale lines: 0.20 mm.

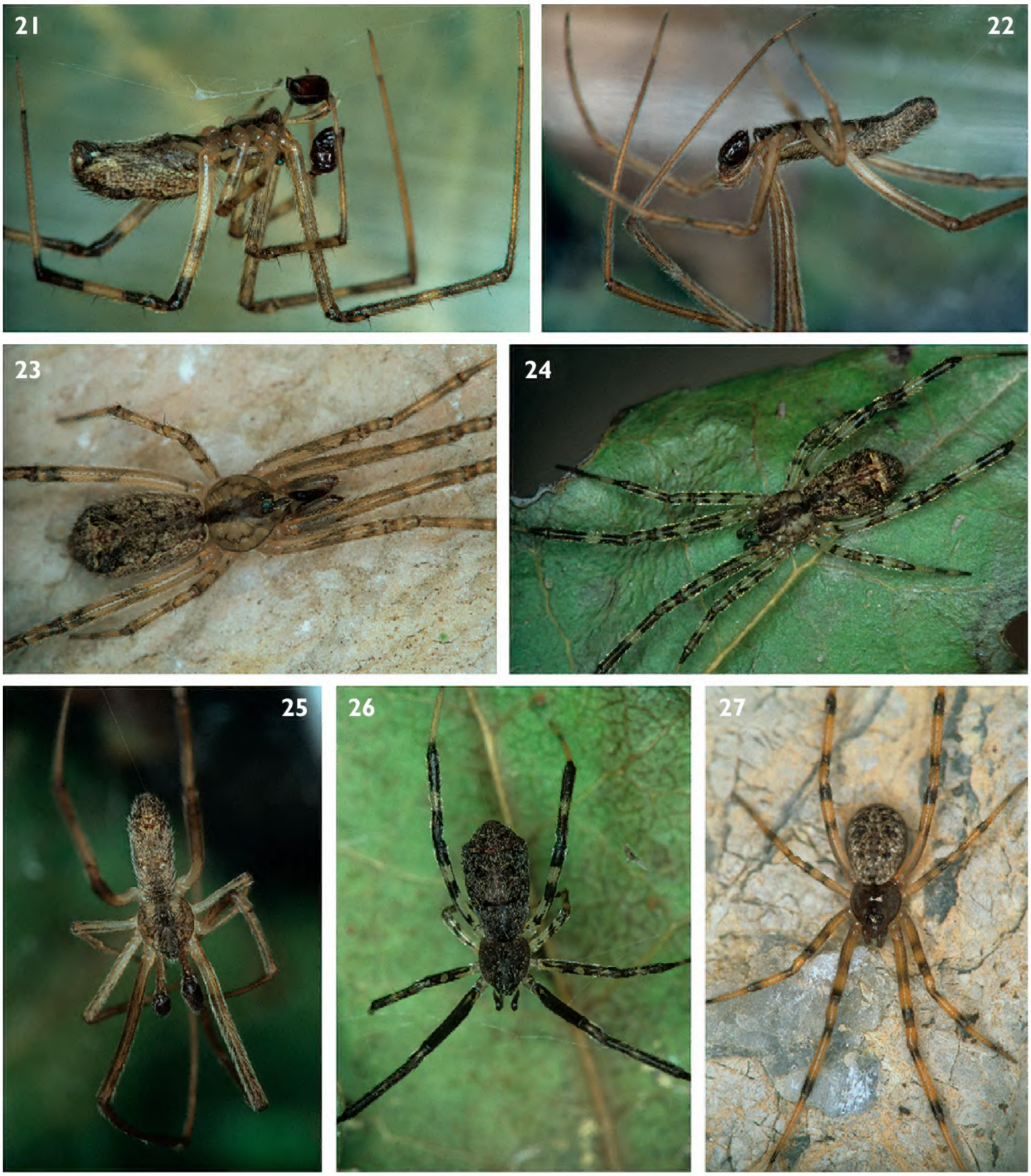
1 subadult ♂ (MHNP AR 2207). **Italy:** Sardinia, Bosco Selene, above Lanusei, 930 m, N 39°52.810 N, 09°31.213' E, beating from scrub and oak, 6 ♂ 5 ♀, 6.6.2003, leg. B. Knoflach and K. Thaler [Th-461, Sa03/20+19]. Sardinia, above Baunei, Golgo-Plateau, 580 m, 40°02.715' N, 09°40.003' E, beating, 1 ♀ 4 juveniles, 7.6.2003, leg. B. Knoflach and K. Thaler [Th-466 Sa03/25]. Liguria, Levanto surroundings, beating scrub and pine, 2 ♀, 19.9.2004, leg. B. Knoflach and K. Thaler [Th-467 OI04/1]. Ibidem, 1 ♀, 20.9.2004 [Th-468 OI04/2]. Ibidem, Monterosso vs. St. Antonia, Colle di Grippa, 200-400 m, beating *Erica arborea*, 1 ♂ 1 ♀, 23.9.2004 [Th-471 OI04/5]. South Tyrol/Alto Adige, Klausen, Säben, 1 ♀, 19.6.2004, leg. B. Knoflach and K. Thaler. **Greece:** Chalkidiki, Sithonia east coast, above Koutloumousi beach, near rill, 1 ♀, 3.5.2000, leg. B. Knoflach and K. Thaler [Th-388 Gr 00/9]. W-Crete, Georgioupolis, 1 ♀, 29.3.1999, swept from scrub, see Knoflach and Thaler (2000) [TH-353 K99-3b]. Voucher specimens deposited in CTh, MHNG, NMW if not specifically indicated.

Measurements. Males (n=5, min-max): Total length 3.9-4.2, carapace length 1.4-1.7, width 1.4-1.6, length femur I 3.4-3.8, tibia I 2.7-3.3 mm. Females (n=5, min-max): Total length 4.8-6.1, carapace length 1.6-1.9, width 1.5-1.7, length femur I 2.7-3.0, tibia I 2.2-2.4 mm.

Selected comparative remarks, diagnosis. *E. maculipes* is well characterised by numerous authors, for details of morphology and distribution see Knoflach and Thaler (2000). Some features are given here for identification and differentiation compared to *E. algiricus*: Prosoma larger than that of *E. algiricus*. Sternum dark, with marked light median stripe, which widens anteriorly. Carapace with clear brown median band and reticulate pattern at margins (Figs 23-24). Legs conspicuously speckled. Venter pale. Male palp larger than that of *E. algiricus* (Figs 21 vs. 22; see also Kulczyński 1905), in ventral view 0.6-0.7 mm broad, 0.9-1.0 mm long (distance between distal rim of tibia and tip of cymbium). Palpal tibia 1.5 times wider



Figures 19-20. *Episinus maculipes numidicus* Kulczyński from Tunisia. Epigynum (**19**), epigynum/vulva, ventral (**20**). Scale line: 0.20 mm.



Figures 21-27. *Episinus maculipes* Cavanna from Sardinia (**21**, **23**, **24**), *E. algiricus* Lucas from Sardinia (**22**, **25**, **26**) and *E. theridioides* Simon from Corsica (**27**). Male (**21-23**, **25**), female (**24**, **26**, **27**).

than long (Simon 1914). Theridiid tegular apophysis (= TA 2 in Knoflach and Thaler 2000) less prominent than in *E. algiricus*. Epigynal cavity wider than long, not overlapping receptacula (Figs 14, 18), with narrow median septum. Cavity 0.25-0.31 mm wide. Posterior margin of cavity less distinct than in *E. algiricus*. Receptacula seminis comparatively large and spherical.

Distribution. This widespread expansive Mediterranean species (for details see Knoflach and Thaler 2000) has recently been reported from Crimea, which is the easternmost record (Kovblyuk et al. 2008).

***Episinus maculipes numidicus* Kulczyński, 1905**
Figs 19-20

E. m. numidica Kulczyński, 1905: 437, pl. 11, figs 4, 17, male, female, type region North Africa.

Description, identification. Kulczyński (1905).

Taxonomic status. Considerations on the subspecific rank have to be postponed owing to lack of material, especially males.

Material examined. Tunisia: Jendouba, Kroumirie near Aïn Draham, 196 m, 1 ♀, (SMF), 16.4.2007, beating and sweeping in macchia, leg. C. Muster.

Measurements. Female (n=1): Total length 3.8, carapace length 1.3, width 1.2, length femur I 1.9, tibia I 1.5 mm.

Somatic features, colouration. The single female shows a similar colour pattern to *E. maculipes*, except for the sternum, which lacks a light median stripe.

Epigynum/vulva (Figs 19-20). Epigynal cavity considerably wider than long, 1.8 times in the examined female. Cavity 0.24 mm wide, about as long as receptacula seminis. Median septum broad and rather short.

Differentiation from *E. maculipes*. As indicated by Kulczyński (1905) *Episinus m. numidicus* is smaller than *E. maculipes*. The following features agree well with the description of Kulczyński (1905): Sternum almost completely dark, without light median stripe. Median septum of female epigynum considerably broader and shorter than in *E. maculipes* (Fig. 19 vs. 14; see also Kulczyński 1905, figs 17 vs. 18). Ratio width to length of epigynal cavity larger in *E. m. numidicus*. Cavity about as long as receptacula, while in *E. maculipes* it is 1.2-1.3 times longer than receptacula.

Distribution. North Africa (Kulczyński 1905).

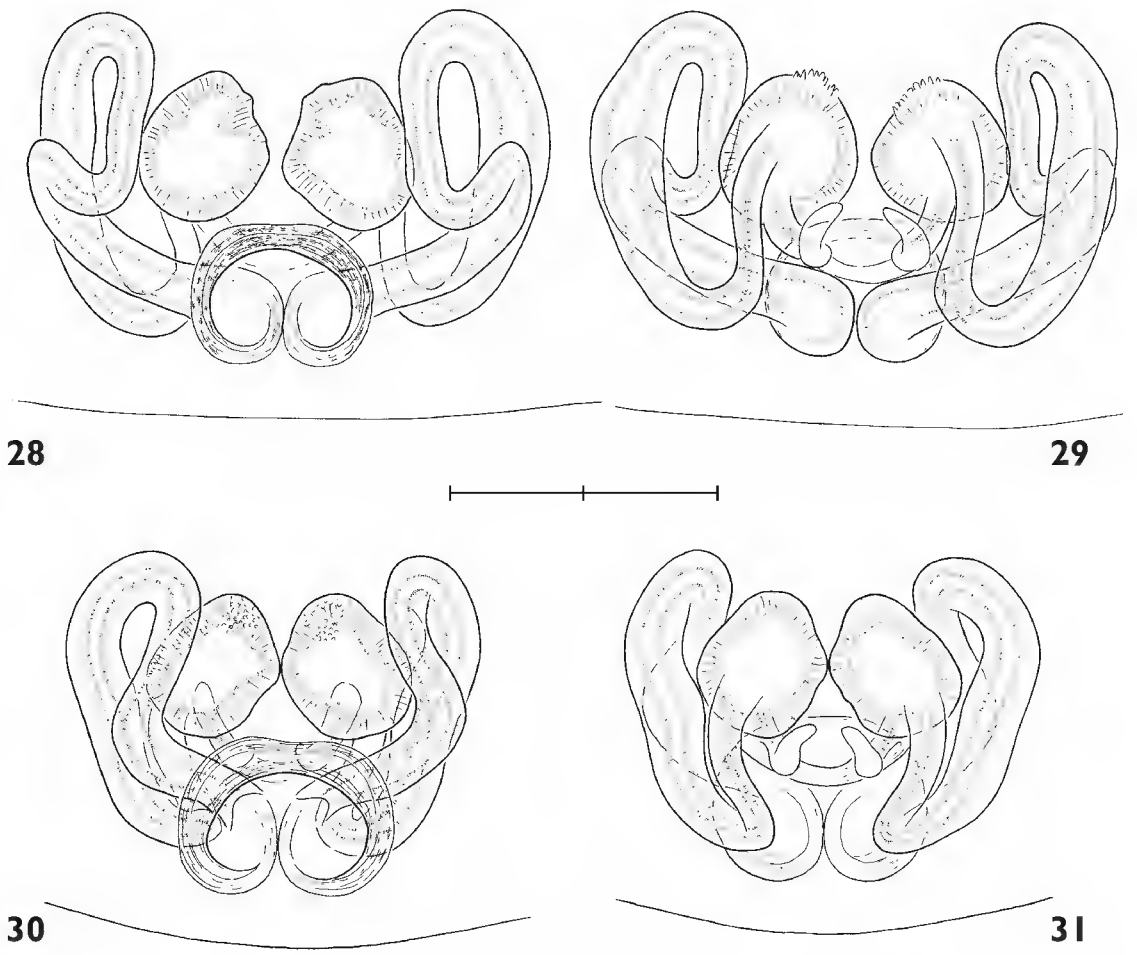
***Episinus theridioides* Simon, 1873**
Figs 27-31

Plocamis pyrenaea Simon, 1914: 246, 291, female, type locality: Pyrénées-Atlantiques (Bosmans and de Castro 2002).

Material examined. France: Pyrénées-Atlantiques, La Rhune, near St-Jean-de-Luz, 2 ♀ 1 juvenile (MHNP AR 2182; type material of *P. pyrenaea,* Simon 1914: 291). Corsica, Haute Asco, 1400-1440 m, 42°23,589' N, 08°55,349' E, under stones from scree at forest line, 2 ♀ (CTh), 12.9.2001, leg. K. Thaler and B. Knoflach [Th-417 Co01/15].

Description, identification. Knoflach (1993), Agnarsson et al. (2007), for further citations see Platnick (2008).

Synonymy. The synonymisation of *E. pyrenaeus* (Simon, 1914) with *E. theridioides* by Bosmans and de Castro (2002) is supported by the present material from the Pyr-



Figures 28-31. *Episinus theridioides* Simon from France, La Rhune (**28-29**; *E. pyrenaeus* AR 2182) and Corsica (**30-31**). Epigynum/vulva, ventral (**28**, **30**), dorsal view (**29**, **31**). All figures drawn at same scale. Scale line: 0.20 mm.

enees and from Corsica, though only females have been compared. General appearance (Fig. 27), shape of epigynum and overall course of copulatory ducts (Figs 28-29) are not or barely different from *E. theridioides* (Figs 30-31).

Distribution. *Episinus theridioides* occurs discontinuously in the Mediterranean (Knoflach and Thaler 2000) and is known only from a few localities in the French and Spanish Pyrenees, Cantabria, Corsica and Sardinia; for a distribution map see Bosmans and de Castro (2002). Unlike members of the *E. truncatus*-group it appears to be an exclusively epigeic species.

Heterotheridion nigrovariegatum (Simon, 1873)

Figs 32-33, 44, 59

Achaearanea xinjiangensis Hu & Wu, 1989: 119, male, female, figs 92.1-5, type region: China, Xinjiang, **syn. n.**

Theridion xinjiangensis: – Zhu 1998: 187, figs 121A-F, male, female.

Theridion xinjiangensis: – Song et al. 1999: 148, figs 82E-F, I-J, male, female.

Heterotheridion nigrovariegatum: – Wunderlich 2008: 388, 460, figs 510-516, male, female, transfer from *Theridion*.

For additional synonyms see Platnick (2008).

Material examined. Uzbekistan: Vil. Tashkent, T. Bostanlyk, Tschatkal mountains, Mt. Surenatra, 1550-1700 m, SSE Karamosov, 2 ♂, 15.6.-17.6.1997, leg. H. and R. Rausch [97-23]. Vil. Kashka Darja, Hissar mountains W, Kukbulok surroundings, 1500 m, 1 ♂, 6.6.1997, leg. H. and R. Rausch [97-15]. Ibidem, 2000-2100 m, 1 ♂, 6.6.1997, leg. H. and R. Rausch [97-16]. Vil. Surchan Darja, 4 km SW Shurob, 14-1500 m, 2 ♂, 26.5.-27.5.1997, leg. H. and R. Rausch [97-8]. Vil. Dzhizak, T. Farish, Nuratau mountains, Hayat-Saj, S Hayat, 950-1100 m, 1 ♂ 1 subadult ♂, leg. H. and R. Rausch [97-4]. **Iran:** Prov. Golestan, Tangegol, E Gonbad-e Qabus, 37°22'N/55°56'E, 800 m, 1 ♂, 22.5.-24.5.2001, leg. E. Heiss. **Turkey:** Adapazari 12 km SSW, branch-off to Sapanca, ca. 100 m, beating at edge of oak forest, 1 male (NMW), 14.6.1967, leg. J. Gruber. **Greece:** Corfu, W of Spartilas, above Pirgi, in olive grove and scrub, beat catches, 1 ♂, 29.5.1996, leg. B. Knoflach and K. Thaler [TH260 Ko96-5]. Corfu, Pantokrator, above Spartilas-Taxiarkhis, 650 m, beat catches around chapel, 1 ♀, 31.5.1996, leg. B. Knoflach and K. Thaler [TH-263 Ko96-8]. **Italy:** Calabria, Catanzaro, Bosco di Stilo, S Paso d. Pietra Spada, 38°29'40"N, 16°21'06"E, 1300 m, 4 ♂, 16.6.2003, leg. H. and R. Rausch [2003-19]. Toscana, Le Regine, Popiglio 800 m, 1 ♀, 15.10.1975, leg. K. Thaler. Molise, Matese, Campitello, 1500-1900 m, 1 ♂, 10.8.1989, leg. G. Osella. Friuli, Trieste, Aurisina, beating from

Figures 32-35. *Heterotheridion nigrovariegatum* Simon (**32-33**), male and female from South Tyrol, courtship (**32**), copulation (**33**). *Theridion genistae* Simon (**34-35**), female from Kephallonia (**34**), male from Corsica (**35**).

Juniperus, 1 ♀, 13.7.1993, leg. F. Bertrandi. Ibidem, 1 ♂, 4.5.1994, 1 ♀, 2.6.1994, 1 ♂ 7 ♀, 17.6.1994, leg. F. Bertrandi. Lombardia, Lago di Garda, Rocca die Manerba, 1 ♂ 1 ♀, 16.6.1964, leg. K. Thaler. Lago di Garda, Riva, Monte Brione, 7 ♂ 1 ♀, 13.6.1964, leg. K. Thaler. South Tyrol/Alto Adige, Klausen, Säben, beat catches, 2 ♂ 4 ♀, 19.6.2004, leg. B. Knoflach and K. Thaler. **Austria:** Northern Tyrol, Oetz, 850-900 m, 2 ♂ 6 ♀, 9.6.2007, leg. Knoflach. Innsbruck surroundings, 700 m, from rolled leaf of *Corylus avellana*, 1 ♀, 27.7.2008, leg. B. Knoflach.

Voucher specimens deposited in CTh, MHNG, MHNP, NHMB, NMW if not specifically indicated.

Description, identification. Wiehle (1937), Miller (1971), Zhu (1998; sub *Theridion xinjiangensis*), Jäger et al. (2000), Deltshev (2003), Nentwig et al. (2003), Wunderlich (2008), for additional citations see Platnick (2008).

Generic placement. Wunderlich (2008) established a new monotypic genus *Heterotheridion* for this strikingly coloured species (Figs 32-33) owing to its genital characters, such as the palpal tibia being elongated into a slender outgrowth, the cymbium with an apical, scaly bulge and a distal embolus directed clockwise (Fig. 59). Furthermore, the anterior median eyes are smaller than the posterior medians, the posterior eye row is procurved and the legs are rather long (Wunderlich 2008). According to its mating behaviour, *H. nigrovariegatum* does not correspond to representatives of the genus *Theridion* (Knoflach 2004). Time and duration of sperm induction and number of insertions are clearly different. Sperm induction takes place independently of copulation and lasts correspondingly longer. Copulation usually consists of two insertions only (Knoflach 2004).

Synonymy. *Theridion xinjiangensis* (Hu & Wu, 1989) is synonymised with *H. nigrovariegatum* from the literature (figs 121 in Zhu 1998) because of the following distinct characters: Conformation of male palp and epigynum very similar (Figs 44, 59). Tibial and cymbial outgrowth typical, bulbus genitalis fully corresponding; conductor characteristically pointed, embolus clockwise, sperm duct highly convoluted within voluminous subtegulum and tegulum, median apophysis inconspicuous and hidden by cymbium (Fig. 59). Epigynum and vulva of *Theridion xinjiangensis* largely resemble those of *H. nigrovariegatum* in shape of copulatory orifices, coiled course of copulatory ducts and relatively large receptacula (Fig. 44). The only apparent morphological difference concerns the opisthosoma, which ends in a small tubercle in *T. xinjiangensis* (see fig. 121B in Zhu 1998). Specimens examined from Uzbekistan strengthen this synonymy. Also the type province Xinjiang is not so far distant from the hitherto known eastern records in Kyrgyzstan and Tajikistan.

Distribution. *Heterotheridion nigrovariegatum* shows a wide distribution range within the Palaearctic, reaching its easternmost limits in Kyrgyzstan, Tajikistan (Mikhailov 1997), W-China (Zhu 1998, Song et al. 1999, sub *T. xinjiangensis*) and Siberia (Simon 1914: 294, without exact locality), and northernmost in the Russian plain (Mikhailov 1997). This distinctive species has also been reported from a few localities in North Africa, Algeria (Denis 1937) and Libya (Bonnet 1959: 4495; Caporiacco 1936a, Ghat). In Europe it has been assigned as Mediterranean-expansive

(Thaler 1981; Knoflach and Thaler 1998). Further records come from several districts in Turkey (Türkeş and Mergen 2007). In Central Europe a preference for xerothermic habitats is evident (Buchar 1975; Thaler 1981; Jäger et al. 2000). *H. nigrovariegatum* lives on vegetation. Females hide in rolled leaves where they guard their egg sacs (Kubcová and Buchar 2005).

Theridion genistae Simon, 1873

Figs 34-40

Theridion genistae Simon, 1873a: 95, male female, type locality: Corsica.
Paidiscura genistae: – Wunderlich 2008: 392, transfer from *Theridion*.

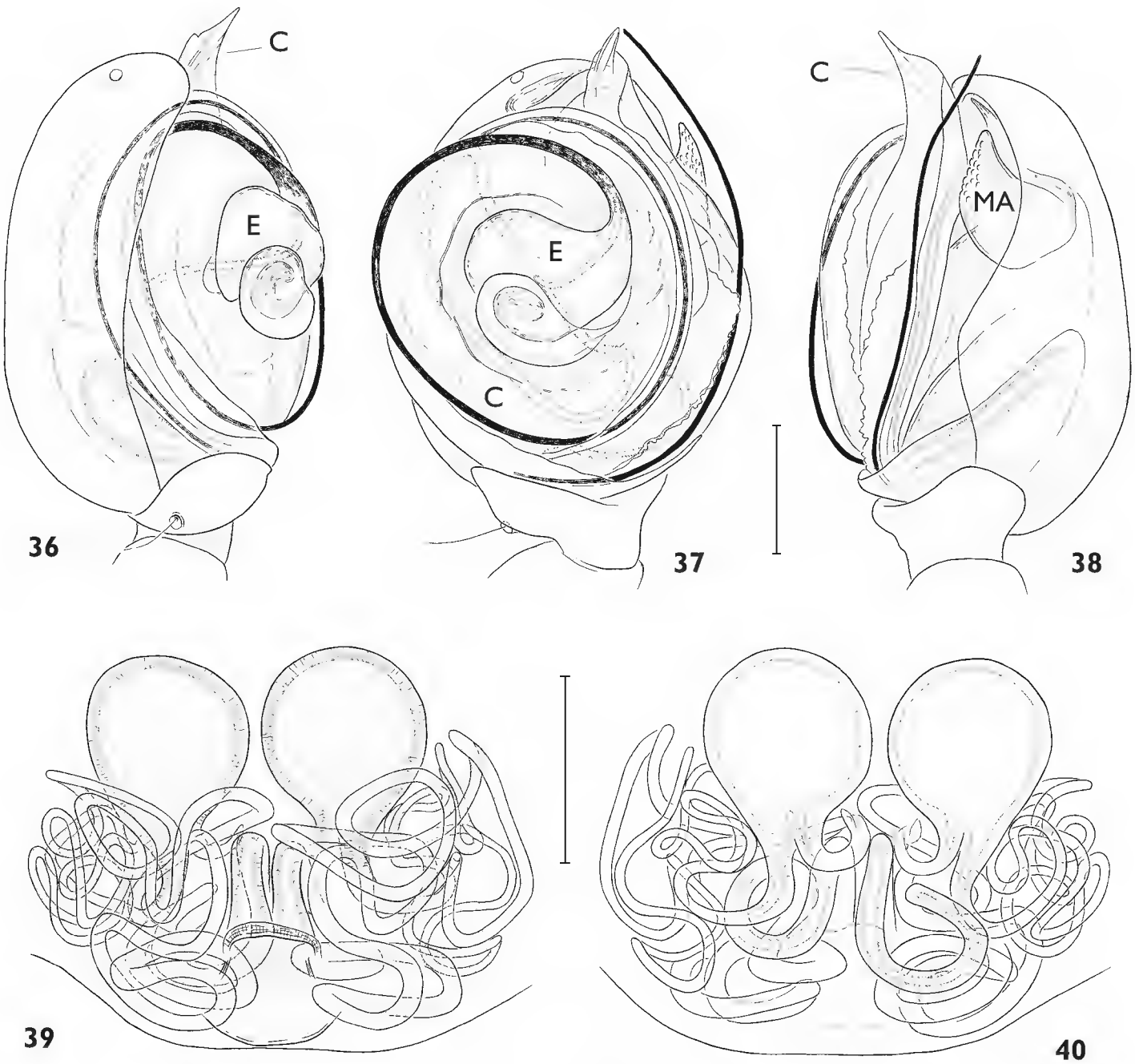
Material examined. France: Corsica, Calvi, Capo di a Veta, 180 m, 42°32'16.5"N, 08°45'11.6"E, beating garigue, *Cistus*, 2 ♂, 29.4.2001, leg. B. Knoflach and K. Thaler [Th-402 Co-01/1]. Corsica, Ostriconi estuary, E Ile Rousse, 42°09'40.4"N 09°03'39.9"E, at sea shore, 5 m, beating shrubs, *Genista*, 17 ♂ 38 ♀, 3.5.2001, leg B. Knoflach and K. Thaler [Th-410 Co-01/9]. **Italy:** Calabria, Sibari, beat catches, 1 ♀, 3.6.1977, leg. S. Meyer. Sardinia, Ogliastra, W Baunei, 718 m, 40°06.319' N, 09°34.867' E, 2 ♂ 1 ♀, 2.6.2003, beating from *Quercus*, leg. B. Knoflach and K. Thaler [Th-443 Sa03/2]. Sardinia, E Dorgali, above Cala Gonone, 40°16.290'N, 09°36.641'E, 220 m, 1 ♀, 2.6.2003, beating in oak forest, leg. B. Knoflach and K. Thaler [Th-447 Sa03/6]. **Greece:** Corfu, Dasia, Sgombou/Gavrolimni, 100 m, beating phrygana and macchia, *Quercus*, 8 ♀, 28.5.1996, leg. B. Knoflach and K. Thaler [TH-259 Ko 96-4]. Corfu, Spartilas surroundings, 500-600 m, beating scrub, 2 ♂ 2 ♀, 29.5.1996, leg. B. Knoflach & K. Thaler [TH-260 Ko 96-5]. Corfu, Spartilas, 600 m, 1 ♀, 3.-4.6.1997, leg. E. Heiss. Kephallonia, Atheras beach, Atheras, 36 m, 38°19.997' N, 20°24.195'E, 30 m, 1 ♂ 19 ♀, 15.5.2002, beating from scrub, leg. B. Knoflach and K. Thaler [Th-427 Ke02/4]. E Crete, Stalida, garden, 1 ♂, 4.-10.4.1998, leg. B. Knoflach and K. Thaler [TH-321 K98/0]. W Crete, Georgioupolis, 1 ♀, 29.3.1999, leg. B. Knoflach and K. Thaler [TH-352 K99-2-3].

Voucher specimens deposited in CTh, MHNG, NHMB, NMW if not specifically indicated.

Description, identification. Wiehle (1960, female), Brignoli (1967, male, female), Vanuytven et al. (1994, male).

Measurements. Males (n=6, min-max): Total length 1.3-1.6, carapace length 0.6-0.8, width 0.5-0.7, length femur I 0.9-1.2, tibia I 0.6-0.9 mm. Females (n=6, min-max): Total length 1.4-1.6, carapace length 0.6, width 0.5-0.6, length femur I 0.6-0.8, tibia I 0.4-0.5 mm.

Somatic features, colouration (Figs 34-35). Small *Theridion* species, carapace and sternum dark brown, legs annulated and abdomen with numerous dark dots and characteristic whitish folium, which widens at midline and fades within whitish area (Fig. 34). Female epigastric region bulging. For details see Simon (1873a).



Figures 36-40. *Theridion genistae* Simon from Corfu. Male palp, retrolateral (**36**), ventral (**37**), prolateral view (**38**). Epigynum/vulva, ventral (**39**), dorsal view (**40**). **36-38** and **39-40** drawn at same scale. Scale lines: 0.10 mm.

Male palp (Figs 36-38). Tibia rather small and short, with one retrolateral trichobothrium. Bulbus largely developed (see also Fig. 35). Embolus forms a long, thread-like spiral. Embolar base with knob-like locking device. Conductor a large, membranous, folded structure with furrow guiding embolus. Median apophysis inconspicuous, with a few scales, hidden within cymbium.

Epigynum/vulva (Figs 39-40). Epigynal atrium tiny and rounded. Copulatory ducts long and highly convoluted, narrowing towards receptacula.

Generic placement: The generic placement of *Theridion genistae* in *Paidiscura* as proposed by Wunderlich (2008) cannot be supported. Neither its general appearance nor structure of the male palpal organ favour such a combination. *T. genistae* shows a cymbial hood typical for *Theridion*, whereas in *Paidiscura* a hook is present. Also leg characters agree with *Theridion*: number of setae on tibiae I-IV 2/2/1/2 and metatarsus III with trichobothrium (see Knoflach and Thaler 2000).

Distribution. Western Mediterranean; known from southern France (Simon 1914; Denis 1935; Soyer 1973; Vanuytven et al. 1994) including Corsica (Simon 1873a, 1914), Algeria (Simon 1914), Tunisia (Simon 1885, 1914), Morocco (Simon 1873a), Italy (Latium, Isola di Zannone; Brignoli 1967). Easternmost records from Greece (present material from Ionian Islands and Crete), where it was hitherto not known (Bosmans and Chatzaki 2005). The species inhabits the vegetation in phrygana/garigue and macchia, which is reflected by the specific epithet referring to *Genista*.

***Theridion genistae turanicum* Charitonov, 1946.** Judging from the illustration of the female genital organs by Charitonov (1946, fig. 29) *Theridion genistae turanicum* Charitonov, 1946 from Uzbekistan appears to belong to the *T. melanurum*-group and is not related to *T. genistae*. This justifies its elevation to species rank, *Theridion turanicum* stat. n.

Theridion glaucinum Simon, 1881

Figs 41-42

T. glaucinum Simon, 1881: 76, female, type locality Isères, Le Bourg-d´Oisans.

Material examined. France: "Alpes" [Rhone-Alpes, Isères, Grenoble, Le Bourg-d´Oisans, see Simon 1881: 77], 1 ♀ (MHNP AR2834, type), det. E. Simon.

Description. Simon (1881: 76, female). Male unknown.

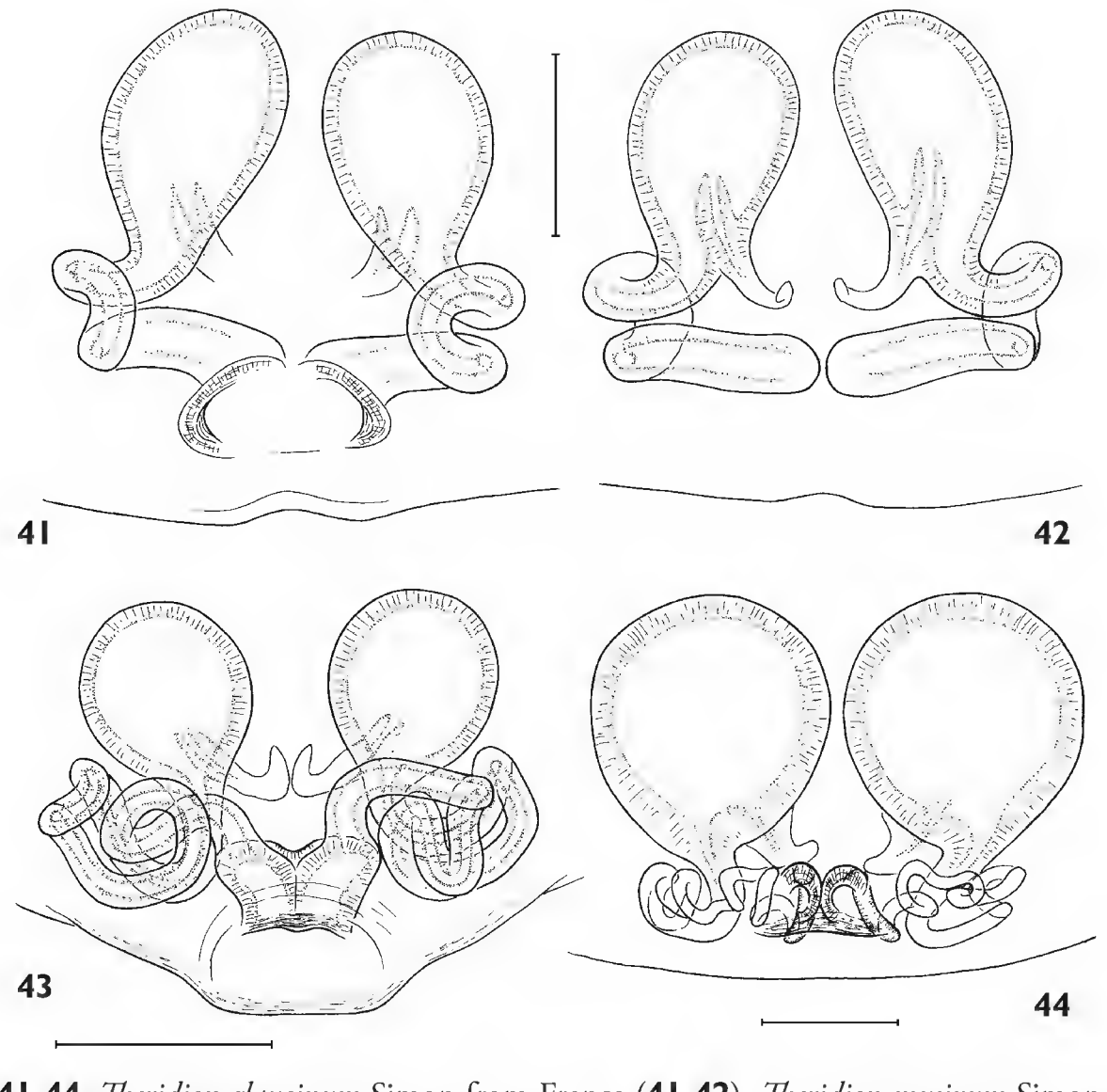
Measurements. Total length 3.0, carapace length 1.0, width 0.9, length femur I 1.8, tibia I 1.6 mm.

Somatic features, colouration. Carapace light, with narrow dark margins and dark central patch. Sternum dark. Legs light yellow with dark annulations. Abdomen in this faded specimen beige, a few faint dots on dorsum and a small dark longitudinal patch on venter. Spinnerets light, surrounded by dark pigmentation. For details see Simon (1881).

Epigynum/vulva (Figs 41-42). Epigynal cavity wider than long, its width 0.09 mm at midline; its overall shape trapezoidal, as anterior and posterior borders unevenly wide. Copulatory ducts rather short, ca. 0.2 mm long. They diverge sideways and form a short inwards coil towards the receptacula thereby gradually narrowing. Receptacula seminis rather elongated.

Affinities. *Theridion glaucinum* appears to be closely related to *T. petraeum* L. Koch, 1872. General appearance and epigynal characters are rather similar. Females of *T. petraeum* are comparatively larger, show an evenly transverse-oval epigynal cavity, copulatory ducts of 0.5 mm length and globular receptacula. As in other representatives of this species group, the epigynum of *T. glaucinum* is filled with mating plug secretions (see Knoflach 1998).

Distribution. Known only from the type locality. No further reference noted since its description.



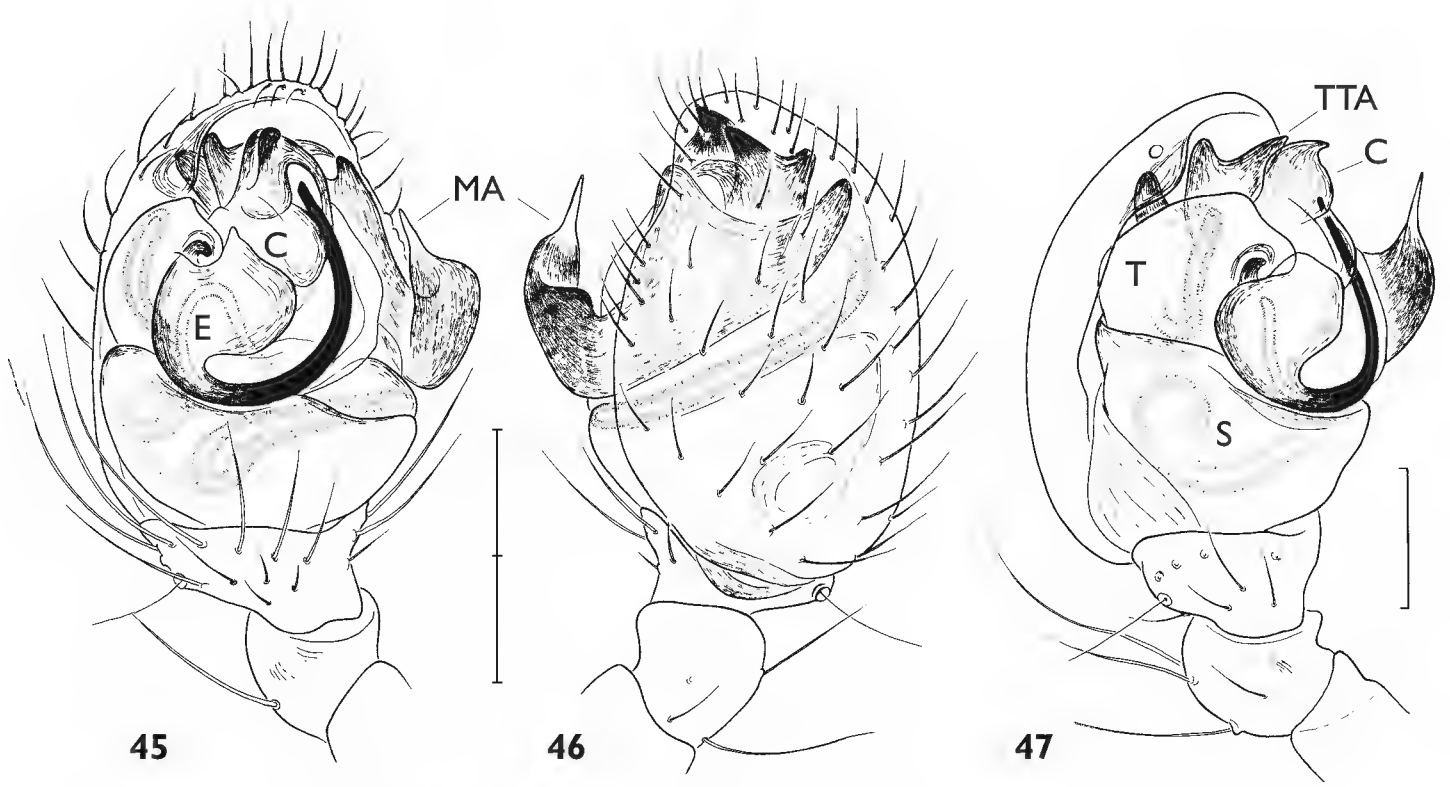
Figures 41-44. *Theridion glaucinum* Simon from France (**41-42**), *Theridion musivum* Simon from Sardinia, Isola San Pietro (**43**) and *Heterotheridion nigrovariegatum* Simon from Northern Italy, Trieste (**44**). Epigynum/vulva, ventral (**41**, **43**, **44**), dorsal view (**42**). **41-42** drawn at same scale. Scale lines: 0.10 mm.

Theridion hannoniae Denis, 1944

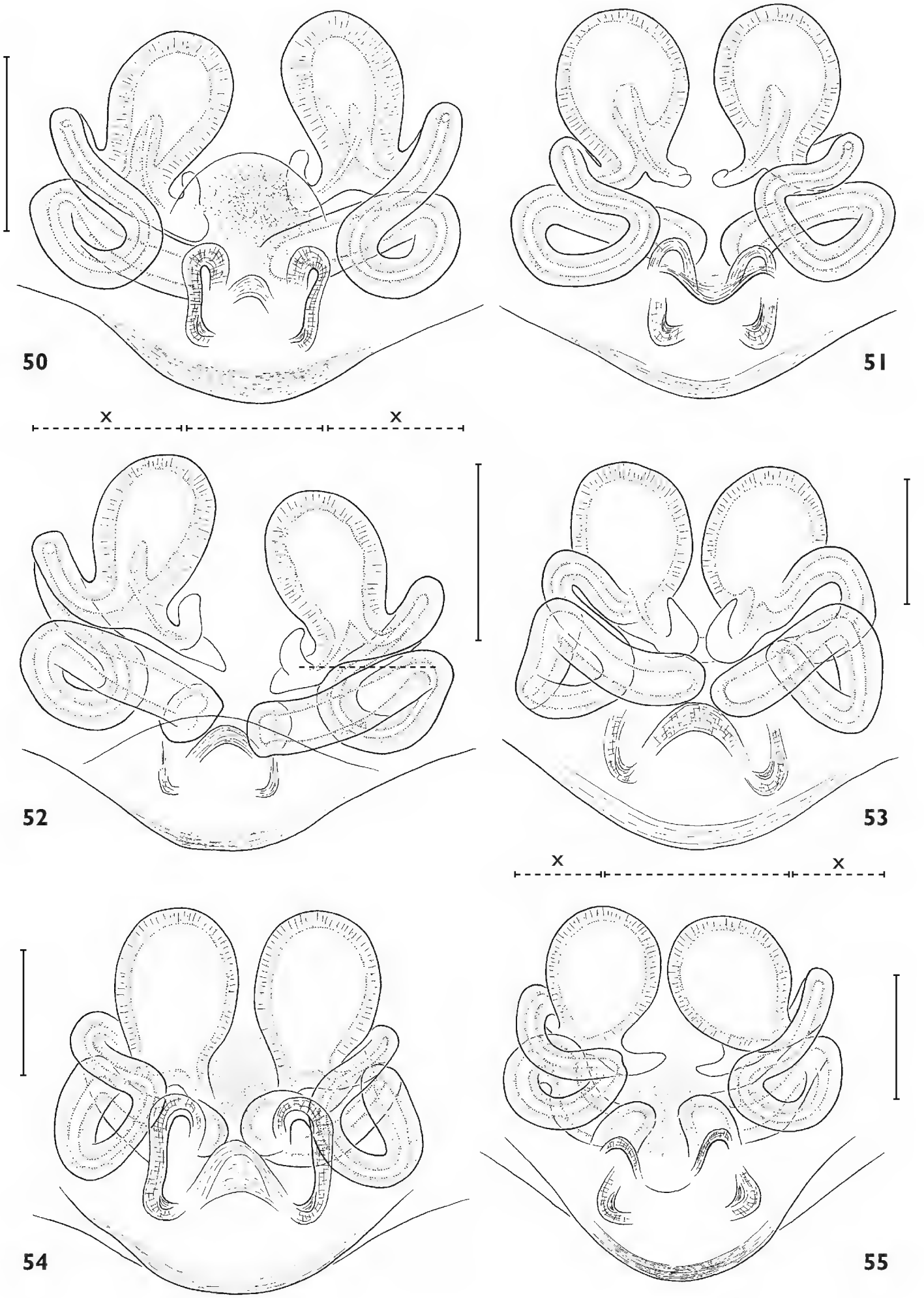
Figs 45-47, 50-52, 56

Material examined. Tunisia: Hammamet, coast, 1 ♀, 27.2.1997, leg. B. Knoflach and K. Thaler. Hammamet W, at coast, 1 ♂, 22.-29.9.1980, leg. E. and A.D. Kreissl. **Algeria:** Souk Harras, 1 ♀ (MHNP AR 2892, sub *Theridion luctinosum*), det. E. Simon (prosoma length 0.78 mm). Collective vial "Constantine, Boghari, Tlemcen", 1 ♂ 6 ♀ (MHNP AR 2890, sub *Theridion petraeum minus*), det. E. Simon. **Portugal:** Faro - Albufeira, Olhos de Aqua, at street, under paper, 1 ♀, 9.7.2001, leg. J. Buchar. Faro, saline area at coast, 1 ♂ 1 juvenile, 9.7.2001, leg. J. Buchar. **Spain:** Lerida-surroundings, xerothermic site, 1 ♀, 22.7.1982, leg. Thaler. Mallorca, Algaida, Alcudia, 2 ♀ (CTh), 1.4.-8.4.1968, leg. V. Mahnert. **France:** N-Corsica, Calvi, Forêt de Bonifatu, Bocca di Erbaghiolu, 42°26'22.1"N 08°50'40.4"E, 800 m, 1 ♂ 1 ♀, 30.4.2001, in boulder scree, leg. B. Knoflach and K. Thaler [Th-405 Co-01/4]. **Italy:** Toscana, Grosseto, Alberese, Sei Busi, pitfall trap, leg. P. Cenzi: 5 ♂ 3 ♀ 2 subadult ♂ 4 juveniles 2.7.1987. 4 ♂ 1 ♀ 1 subadult ♂ 4 juveniles 23.7.1987. 1 ♂ 8.8.1987. 6 ♂ 1 subadult ♂ 1.9.1987.

3 ♂ 1 juvenile 20.9.1987. 2 ♂ 1 subadult ♂ 7 juveniles 10.10.1987. 1 ♂ 1 subadult ♂ 1 juvenile 30.10.1987. 10 ♂ 5 ♀ 9 subadult ♂ 12 juveniles 11.12.1987. 4 ♂ 8 ♀ 1 subadult ♂ 1 juvenile 1.4.1988. 2 ♂ 5 ♀ 4 juveniles 1.5.1988. 2 subadult ♂ 38 juveniles 2.6.1988. 3 ♂ 1 ♀ 6 juveniles 2.7.1988. Toscana, Grosseto, Alberese, Le Tofane, pitfall trap, leg. P. Cenzi: 1 ♂ 7 juveniles 2.7.1987. 1 ♂ 1 ♀ 1 subadult ♂ 2 juveniles



Figures 45-49. *Theridion hannoniae* Denis from Corsica; Forêt de Bonifatu (**45-46**) and Italy, Venezia (**47**). *Theridion pyrenaeum* Denis from Spain, Sierra Nevada (**48-49**). Male palp, ventral (**45**, **48**), prolateral (**46**, **49**), retrolateral-ventral view (**47**). All figures drawn at same scale. Scale lines: 0.20 (**45-46**, **48-49**), 0.10 mm (**47**).



Figures 50-55. *Theridion hannoniae* Denis from Mallorca (**50**, **52**) and Italy, Toscana (**51**). *Theridion pyrenaeum* Denis from Spain, Sierra Nevada (**53**, **54**) and France, Pyrenees (**55**). Epigynum/vulva, ventral (**50-51**, **54-55**), dorsal view (**52-53**). Scale lines: 0.10 mm.

23.7.1987. 2 juveniles 8.8.1987. 5 ♂ 1 subadult ♂ 2 juveniles 1.9.1987. 3 juveniles 20.9.1987. 2 ♂ 3 subadult ♂ 7 juveniles 10.10.1987. 1 ♂ 1 juvenile 30.10.1987. 6 ♂ 1 ♀ 3 subadult ♂ 3 juveniles 11.12.1987. 1 ♂ 2 ♀ 1.4.1988. 2 ♂ 2 ♀ 1 juvenile 1.5.1988. 3 ♀ 6 juveniles 2.6.1988. 4 ♂ 2 ♀ 1 juvenile 2.7.1988. Emilia-Romagna, Forli, 4 ♂, 1992, pitfall trap, leg. M. Paoletti and V. Celano.

Voucher specimens deposited in CTh, MHNG, MHNP, NHMB, NMW if not specifically indicated.

Description, identification. Denis (1944), Wunderlich (1987; sub *T. denisi* Wunderlich, 1987), Thaler and Noflatscher (1990), Bosmans et al. (1994), Kloid (1994), Roberts (1998), Nentwig et al. (2003), Warmingham and Merrett (2009, in press).

Measurements. Fig. 56, smaller sibling species of *Theridion pyrenaeum*. Males (n=5, min-max): Total length 1.6-1.9, carapace length 0.7-0.8, width 0.6-0.7, length femur I 1.2-1.3, tibia I 1.0-1.1 mm. Females (n=5, min-max): Total length 2.0-2.9, carapace length 0.7-0.8, width 0.7-0.8, length femur I 0.9-1.3, tibia I 0.7-1.0 mm.

Somatic features, colouration. Carapace and sternum brown to dark brown. Legs yellowish with dark annulations. Abdomen greyish brown with dorsal whitish folium. Venter dark, with two distinct white patches. Male epigaster protruding. Colour pattern as in *Theridion pyrenaeum*.

Male palp (Figs 45-47). Conformation of male palp as in other representatives of the *Theridion varians* group (see Knoflach 1998). Conductor, median apophysis and theridiid tegular apophysis of specific shape, albeit highly concordant with the sibling species *T. pyrenaeum*. Median apophysis sickle-shaped, with abruptly narrowing, pointed, light prolateral tip. Theridiid tegular apophysis bifid. Differentiation from *T. pyrenaeum* by smaller dimension: Cymbium 0.32-0.38 mm long (mean 0.35, n=13). Distal part of embolus 0.18, 0.20, 0.25 mm long (n=3).

Epigynum/vulva (Figs 50-52). Epigynal cavity marked by two longitudinal, sclerotised ridges encircling roughly a square, with copulatory orifices situated at the anterior edges. Copulatory ducts diverge sideways, form a wider inwards coil and another small turn before entering receptacula. Overall genital morphology as in *T. pyrenaeum*, distinguished by size and proportion of following parts: Epigynal cavity smaller than in *T. pyrenaeum*, 0.06-0.08 mm wide (mean 0.07, n=10), less than or as wide as the distance to outside of ducts (x, Fig. 50). Receptacula seminis distinctly longer than epigynal cavity.

Phenology. In Belgium Bosmans et al. (1994) found males from June to October only, while juveniles and females were abundant throughout the year. Present data from Tuscany reveal considerable male activity also during the winter season (Table 1).

Distribution. Western Mediterranean, apparently expanding northwards. *Theridion hannoniae* is known from North Africa (Algeria, Tunisia), Macaronesia, South-West-Europe and by scattered records from Central-Europe (Bosmans et al. 1994). Numerous European records come from Portugal, Spain, France (type locality Douchy, NE-France) and Belgium. Recently, the species has also been found in Germany (Kloid 1994, Staudt 2003) and Wales (Warmingham 2008). The easternmost border of its distribution currently appears to lie in Italy (South Tyrol, Thaler and Noflatscher 1990;

and present data from Tuscany and Emilia-Romagna). In northern Italy it may almost meet its eastern vicariant *Theridion refugum*, another representative of this still insufficiently known, ground-living, lapidicolous species complex. The allopatric occurrence of these closely allied species indicates different glacial refugia and respective reinvading processes. In contrast to its sibling *T. pyrenaeum*, *T. hannoniae* appears to be

Table 1. Phenological activity of *Theridion hannoniae* in Tuscany, Grosseto, Alberese (Sei Busi and Le Tofane) in 1987 and 1988, pitfall trapping by P. Cenzi. Abbreviations/explanations: sad M - subadult male, juv. M - juvenile male, juv. F - juvenile or subadult female, inad – inadult specimen, early instar.

	Male	Female	sad M	juv M	juv F	inad
02.07.1987	6	3	2	3	1	6
23.07.1987	5	2	2	4	1	1
08.08.1987	1	-	1	1	1	-
01.09.1987	10	-	2	-	-	2
20.09.1987	2	-	-	-	-	4
10.10.1987	4	-	4	4	5	7
30.10.1987	2	-	1	-	-	2
11.12.1987	17	6	12	2	9	4
01.04.1988	6	10	1	1	1	-
01.05.1988	3	6	-	-	-	7
02.06.1988	-	3	2	3	3	38
02.07.1988	7	3	-	-	-	7

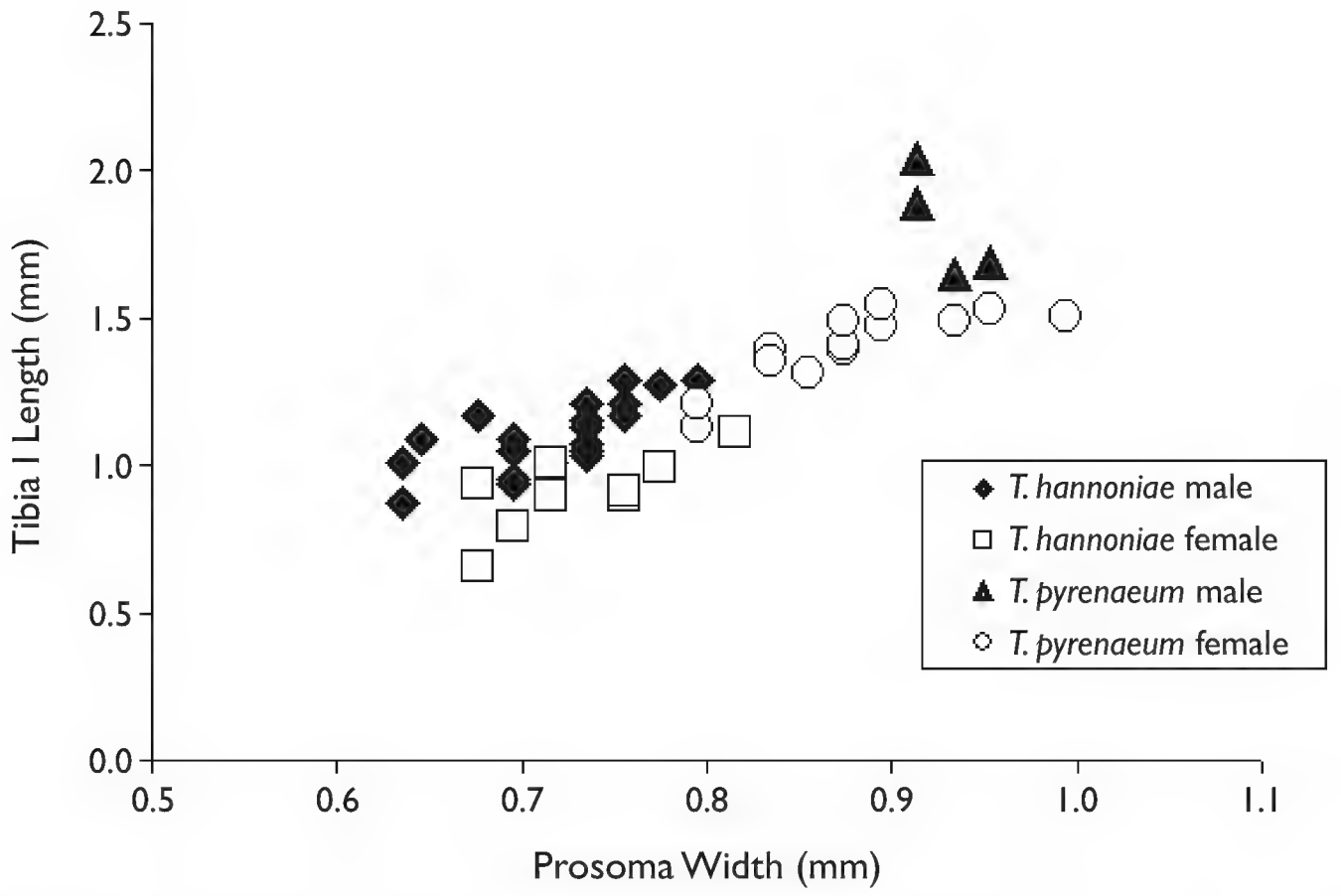


Figure 56. Relationship of prosoma width and length of tibia I in *Theridion hannoniae* Denis and *T. pyrenaeum* Denis. Open symbols represent females, closed males.

restricted to lower altitudes; highest localities being about 800-1100 m. *T. hannoniae* occurs under stones in natural boulder fields and scree, but also in human debris, such as quarries, dikes and railway constructions (Bosmans et al. 1994; Staudt 2003).

Theridion hemerobium Simon, 1914

Figs 57-58

Material examined. Greece: Peloponnesos, Nafplio, Argos, brookside, 1 ♂ (CTh), 22.6.2000, leg. J. Buchar.

Description, identification. Differentiation from the closely related, larger *T. pictum* see Levi (1957a, sub *T. berkeleyi*), Blick et al. (1993), Bosmans et al. (1994), Roberts (1995), Nentwig et al. (2003), Almquist (2005). For additional citations and synonyms see Platnick (2008).

Male palp (Figs 57-58). Palp less elongated and considerably smaller than in *T. pictum*, length of tibia and tarsus ca. 0.4 mm (versus ca. 0.7 in *T. pictum*). Tibia rather broad at base as compared with distal rim, about 0.7 of distal width in ventral view, thus little constricted. Shape of conductor and median apophysis diagnostic. Prolateral tip of median apophysis closer to tip of conductor than in *T. pictum*. Embolus short, distal part 0.12 mm long (*T. pictum* 0.3 mm, see Knoflach 1998).

Distribution. *Theridion hemerobium* is widespread in North America (Levi 1957a) and Europe (Bosmans et al. 1994; Anthes 2000). From Greece it was hitherto not known (Bosmans et al. 1994; Anthes 2000; Bosmans and Chatzaki 2005). The present finding bridges a distribution gap in southeast Europe, though its occurrence is not surprising. A further record comes from Bulgaria (Deltshev 1992); the easternmost one from Israel (Levy 1998). Interestingly, the species has so far not been mentioned from Russia (Mikhailov 1997, 1998). *T. hemerobium* occurs stenotopically on the vegetation in wetlands and on banks of lakes, ponds and running water (Anthes 2000) and also colonises human-made structures in these habitats, e.g. bridges and fences (Jones 1994; Daws 2003).

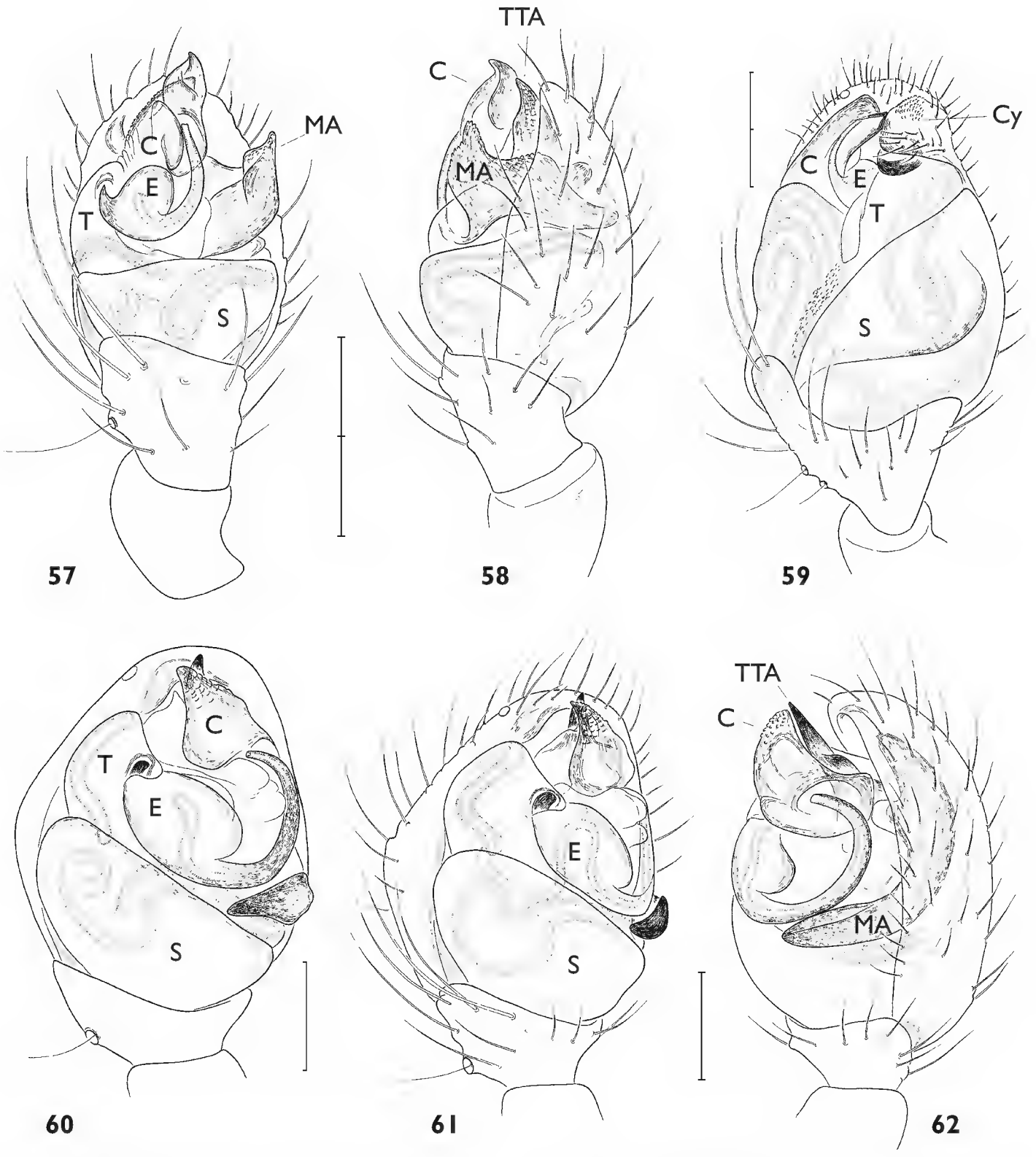
Theridion musivum Simon, 1873

Figs 43, 60-64

T. musivum Simon, 1873a: 94, pl. 2, f. 26, male female, type region: Corsica.

Material examined. Croatia: Istria, Rovinj surroundings, agricultural site, 1 ♀ (CTh), 4.8.1965, leg. K. Thaler [Yu 65-15]. **Italy:** Sardinia, Isola Serpentara, 2 ♀ 1 juvenile, 9.5.1988 Vaglio, leg. G. Osella and Gregori. Sardinia, Isola di San Pietro, Stagno di Cala Vinagra, 1 ♀, 13.5.1988, leg. Gregori, ded. G. Osella. Sardinia, Isola di San Pietro, Pendici, Mte Guardia dei Mori, 1 ♀, 10.6.1989, leg. G. Osella. Sardinia, Oristano, Su Pallosu, 1 ♀, 24.-28.4.1992 leg. E. Heiss. Sardinia, Baunei/Dorgali, close to branch-off

to Codula di Luna, 635 m, 40°05.791' N, 09°33.158' E, 2 ♀ (CTh), 5.6.2003, pasture plateau, beating *Cistus*, leg. B. Knoflach and K. Thaler [Th-454 Sa03/13]. **France:** Corsica, Calvi, Capo di a Veta, 180 m, 42°32'16.5"N 08°45'11.6"E, beating garigue, *Cistus*, 1 ♀, 29.4.2001, leg. B. Knoflach and K. Thaler [Th-402, Co-01/1]. Corsica, Ostriconi-estuary, E Ile Rousse, 42°09'40.4"N 09°03'39.9"E, at sea shore, 5 m, beating shrubs, *Juniperus*, 2 ♀, 3.5.2001, leg. B. Knoflach and K. Thaler [Th-410 Co-01/9]. Gabas (Br.), 18 ♂ 4 subadult ♂ 40 ♀ 16 juveniles (MHNP AR 2244 sub *T. varians*). Vaucluse, Vaison, 1 ♂ (MHNG), 18.5.1953, leg. A. Comellini. **Spain:** Mallorca, Palma, Camp de Mar,



Figures 57-62. *Theridion hemerobium* Simon from Peloponnese (**57-58**). *Heterotheridion nigrovariegatum* (Simon) from Uzbekistan, Surchan Darja (**59**). *Theridion musivum* Simon from France, Vaucluse (60) and Gabas (**61-62**). Male palp, ventral (**57**, **59**, **60**, **61**), prolateral view (**58**, **62**). **57-58** and **61-62** drawn at same scale. Scale lines: 0.2 (**57-59**) and 0.1 (**60-62**) mm.

Castillo de Bellver, 1 ♀ (CTh), April 1974. **Tunisia:** Kairouan – Ouesslatia, 35°49'5.7"N 9°45'8.9"E, 288 m, beating *Juniperus* and *Pinus*, 1 ♂ (CTh), 26.4.2007, leg. C. Muster. Kebili, Zaafrane, 15 km W Douz, palm grove, tamarisk, 33°26'44.2"N 8°54'7.6"E, 50 m, 3 ♂ 1 subadult ♂ (CM), 21.4.2007, leg. C. Muster. Hammamet, coastal garden, beating scrub, 1 ♀, 27.2.1997, leg. B. Knoflach and K. Thaler [TH-293 Tun97-2].

Voucher specimens deposited in CTh, MHNG, MHNP, NHMB, NMW if not specifically indicated.

Description, identification. Wiehle (1960), Levy and Amitai (1982), Levy (1998), see also Platnick (2008).

Measurements. Males (n=5, min-max): Total length 1.5-1.7, carapace length 0.6-0.7, width 0.6-0.7, length femur I 1.0-1.1, tibia I 0.6-0.7 mm. Females (n=5, min-max): Total length 1.8-2.3, carapace length 0.7-0-8, width 0.7-0.8, length femur I 0.9-1.0, tibia I 0.5-0.6 mm.

Somatic features, colouration (Figs 63-64). Overall colouration of carapace, sternum, gnathocoxae and chelicerae bright red in living specimens. This striking colour fades in specimens preserved in alcohol. Legs and palps lighter, with distal femora, patellae and distal tibiae reddish, but no dark annulations. Abdomen uniformly dark brown to ruby coloured. Male epigaster sclerotised, seminal vesicle (part of male genital system) conspicuously dark, translucent.

Male palp (Figs 60-62). Tibia very short, wider than long, with one retrolateral trichobothrium. Embolar base with anchoring process for tegular notch, as in other *Theridion* species. Distal part of embolus rather short (0.2 mm long) and stout. Conductor covered with minute scales. Theridiid tegular apophysis straight and pointed, closely adjoining conductor. Median apophysis sickle-shaped.

Epigynum/vulva (Fig. 43). Entrance of copulatory ducts distinctly sclerotised, visible through integument. Ducts 0.46 mm long, forming several overlapping, short coils. Receptacula seminis globular.

Distribution. Mediterranean region, most records coming from Southwest Europe and North Africa: France (Simon 1914; Denis 1934; type locality Corsica "commun en Corse sur les buissons" Simon 1873a), Spain (Simon 1914), Portugal (Cardoso 2009), Italy (Caporiacco 1922, 1936b), Croatia (present paper), Morocco (Simon 1909, 1914), Algeria (Simon 1914) and Tunisia (Pavesi 1884). More recently, *Theridion musivum* has also been shown to occur in Sinai, Egypt (Levy 1998).

Theridion pinicola Simon, 1873

Figs 65-67, 69-75

Theridion pinicola Simon, 1873b: 364, 371, male female. Type locality: Corsica.
Paidiscura pinicola: – Wunderlich 2008: 392, transfer from *Theridion*.

Material examined. France: Corsica, 3 ♂ 35 ♀ 4 juveniles (MHNP AR 2257). N Corsica, Calvi, Forêt de Bonifatu, Bocca di Erbaghiolu, 1200 m, 42°25'15.0"N

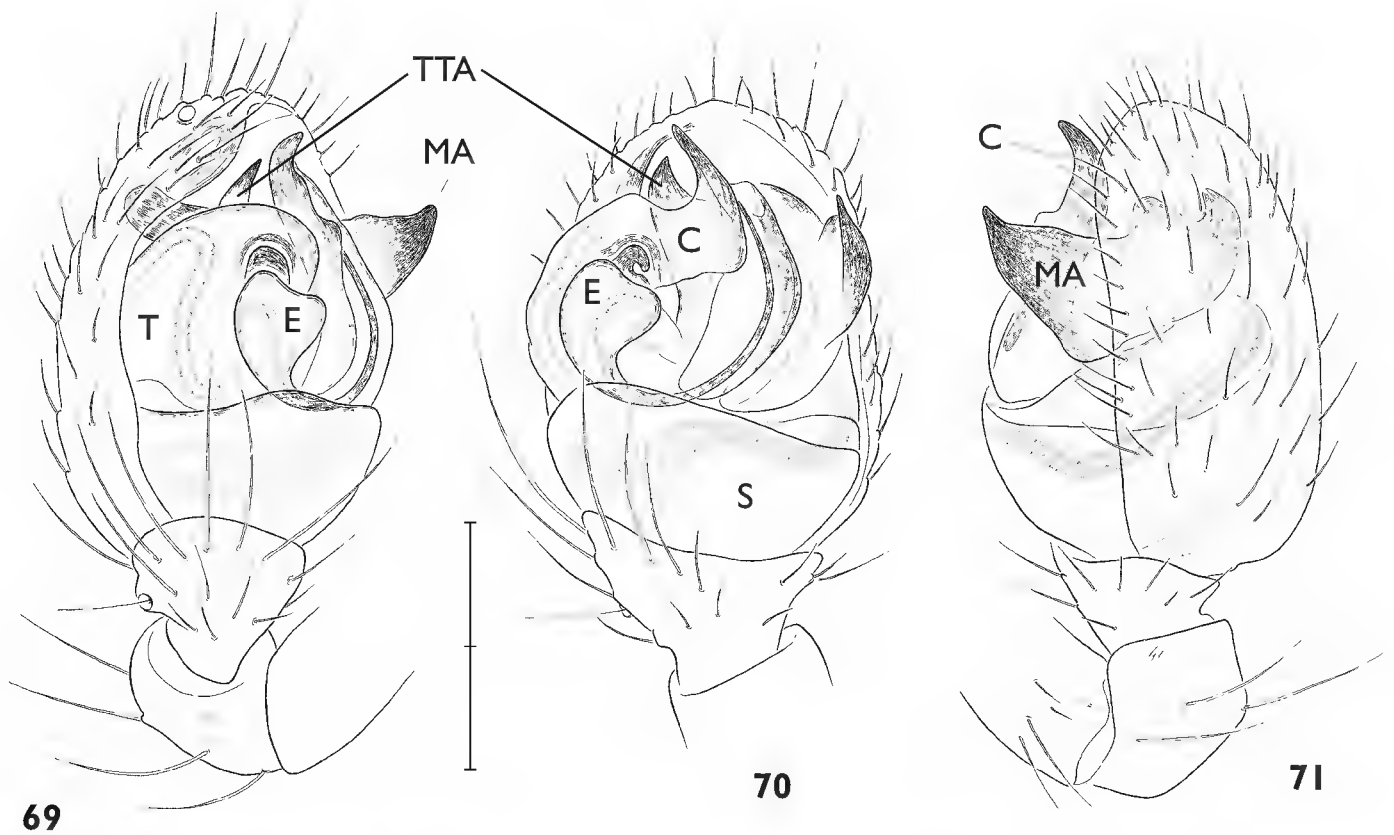
08°50'15.5"E, beating from *Pinus nigra laricio*, 5 ♂ 3 ♀ 1 subadult ♂ 1 subadult ♀, 2.5.2001, leg. B. Knoflach and K. Thaler [Th-409 Co-01/8]. Ibidem, 1200 m, 3 ♂ 1 ♀ 3 subadult ♂, 30.4.2001. Corsica, Haute Asco, 42°23'32.2"N 08°55'08.9"E, 1400-1440 m, 2 ♀, 12.9.2001, beating pine at timber line, leg. B. Knoflach and K. Thaler [Th-417 Co01/15]. **Tunisia:** Kasserine, W Thélepte, Dernaya (close to Algerian border), 35°7'24.3"N 8°28'57.0"E, 1120 m, sparse pine wood, 2 ♂ (1 ♂ CM, 1 ♂ SMF), 19.4.2007, leg. C. Muster.

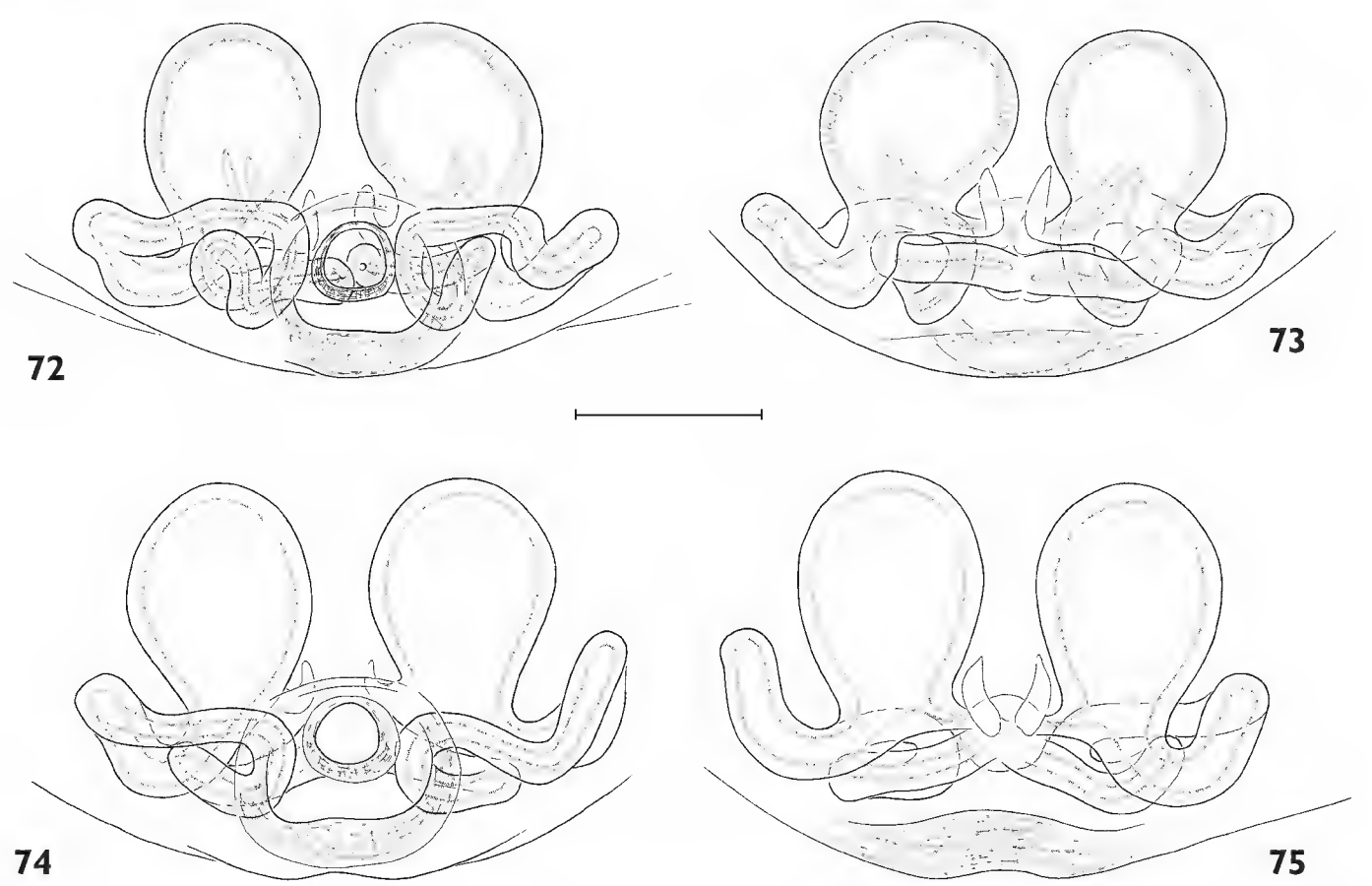
Figures 63-68. *Theridion musivum* Simon (**63-64**), female from Corsica (**63**), female guarding egg-sac from Sardinia (**64**). *T. pinicola* Simon from Corsica (**65-67**), male (**65-66**), copulating pair (**67**). *T. semitinctum* Simon from Northern Italy, female vulva, dorsal view (**68**).

Voucher specimens deposited in CTh, MHNG, NMW if not specifically indicated.

Description, identification. The species has not been reported since the original description of Simon (1873b: 364, 371; 1881: 105).

Measurements. Males (n=5, min-max): Total length 1.5-1.9, carapace length 0.7-0.9, width 0.7-0.8, length femur I 0.9-1.1, tibia I 0.6-0.8 mm. Females (n=5, min-





Figures 69-75. *Theridion pinicola* Simon from Corse, Forêt de Bonifatu. Male palp, retrolateral (**69**), ventral (**70**), prolateral view (**71**). Epigynum/vulva, ventral (**72**, **74**), dorsal view (**73**, **75**). **69-71** and **72-75** drawn at same scale. Scale lines: 0.20 (**69-71**) and 0.10 mm (**72-75**).

max): Total length 1.5-2.4, carapace length 0.7-0-8, width 0.6-0.7, length femur I 0.7-0.9, tibia I 0.5-0.6 mm.

Somatic features (Figs 65-67). Carapace yellowish with thin dark margins and dark median band from eye region to midline. Sternum light, its margins may be diffuse dark. Legs yellowish with dark annulations from distal femora onwards. Abdomen dark brown, dorsum usually with whitish median folium. Male epigaster protruding.

Male palp (Figs 69-71). Conformation of male palp as in other representatives of the *Theridion varians* group (see Knoflach 1998). Tibia short, with one retrolateral trichobothrium. Conductor pointed and curved. Prolateral part of median apophysis triangular and strongly protruding. Theridiid tegular apophysis pointed. Embolus slender. Distal part of embolus 0.25 mm long.

Epigynum/vulva (Figs 72-75). Epigynal cavity rounded, its posterior border strongly sclerotised; with central copulatory orifices fused to common, rounded opening. Copulatory ducts ca. 0.4 mm long. They diverge laterally, forming a few coils, turn inwards and enter the receptacula by a final wide coil. In mated females the epigynal cavity is filled by plug secretions. All parts of vulva clearly translucent through integument.

Copulatory behaviour. Copulation follows the pattern of the *Theridion varians* group, with 6-8 sperm inductions, a presumed initial pseudocopulation and a final mating plug sequence (Knoflach 2004).

Generic placement: The generic placement of *Theridion pinicola* in *Paidiscura* by Wunderlich (2008) has to be rejected, since there is no convincing argument for such a combination. *T. pinicola* is clearly a member of the *T. varians* group, see above and Knoflach (2004), for *Paidiscura* see Knoflach and Thaler (2000).

Distribution. *Theridion pinicola* was hitherto known only from Corsica (Simon 1873b, 1881, 1914). The present new record from Tunisia suggests a wider distribution. As indicated by the naming of Simon the species occurs on pines, and appears to be a specialised inhabitant of pine forest, "en été sur les pins" (Simon 1881).

Theridion pyrenaeum Denis, 1944

Figs 48-49, 53-55, 56

Material examined. Spain: Sierra Nevada, Veleta route, 2600 m, boulder fields, 3 ♂ 9 ♀ 1 subadult ♂ 1 subadult ♀ (CTh), 18.7.1982 and 19.7.1982, leg. K. Thaler [Sp82-2, 82-7]. Sierra Nevada, Corral de Veleta, 3000 m, 1 ♀ (MHNG), leg. K. Thaler [Sp82-5]. **France:** Pyrenees, Larruns, Arrens, E Col d'Aubisque, 1600 m, scree, 1 ♂ 4 ♀ 1 subadult ♂ 1 juvenile (CTh), 14.7.1982, leg. K. Thaler [Py 82-11]. Pyrenees Orientales, Massif du Canigou, between Chalet de Cortalets and Cirque, 2200-2400 m, 1 ♀ (NMW), 26.9.1983, leg. K. Thaler [F83-8].

Description, identification. Denis (1944), Bosmans et al. (1994).

Taxonomic status. The statement of Bosmans et al. (1994: 238) ".. further material of *T. pyrenaeum* is needed to allow a biometric study of some parts of the palp and epigyne to decide about the status of this species" indicates its close similarity to

T. hannoniae and the arising problem of interspecific/intraspecific classification. This requirement remains. Judging from the present specimens, *T. pyrenaeum* is larger in body and leg size, although in the females this was not always clearly reliable (Fig. 56). However, the dimensions of the male and female genitalia (cymbium length and width of epigynal cavity) from various locations show consistent differences.

Measurements. This is a similar, but larger, species compared to *Theridion hannoniae* (Fig. 56). Males (n=4, min-max): Total length 2.2-2.5, carapace length 1.0, width 0.9-1.0, length femur I 1.8-2.2, tibia I 1.6-2.0 mm. Females (n=5, min-max): Total length 2.0-3.0, carapace length 0.8-1.0, width 0.8-1.0, length femur I 1.4-1.8, tibia I 1.1-1.5 mm.

Somatic features, colouration. Not distinguishable from *Theridion hannoniae*, see above.

Male palp (Figs 48-49). Conformation of male palp: see *T. hannoniae*, as palpal elements do not differ in shape. Differentiation from *T. hannoniae* by larger dimensions: Cymbium 0.50-0.52 mm long (n=4). Distal embolus 0.38-0.40 mm long (n=2).

Epigynum/vulva (Figs 53-55). Overall genital morphology as in *T. hannoniae*, distinguished by size and proportion of following parts: Epigynal cavity larger than in *T. pyrenaeum*, 0.12-0.15 mm wide (n=11), its width exceeding the distance to outside of ducts (x, Fig. 53). Receptacula seminis as long as or shorter than width of epigynal cavity.

Distribution. According to the current state of knowledge *Theridion pyrenaeum* appears to be endemic to western European mountain systems, in allopatry with the widespread *T. hannoniae*. Up to the present, *T. pyrenaeum* has been found only in the French and Spanish Pyrenees and Sierra Nevada (Spain). There it is confined to the higher zones, between 2500 and 3130 m altitude in Sierrra Nevada, about 2000 m in the type region Andorra (Denis 1957) and between 1600 and 2400 in the French Pyrenees (present paper). Ecological preference and altitudinal zoning resemble that of *Theridion petraeum* in the Alps.

Theridion semitinctum Simon, 1914

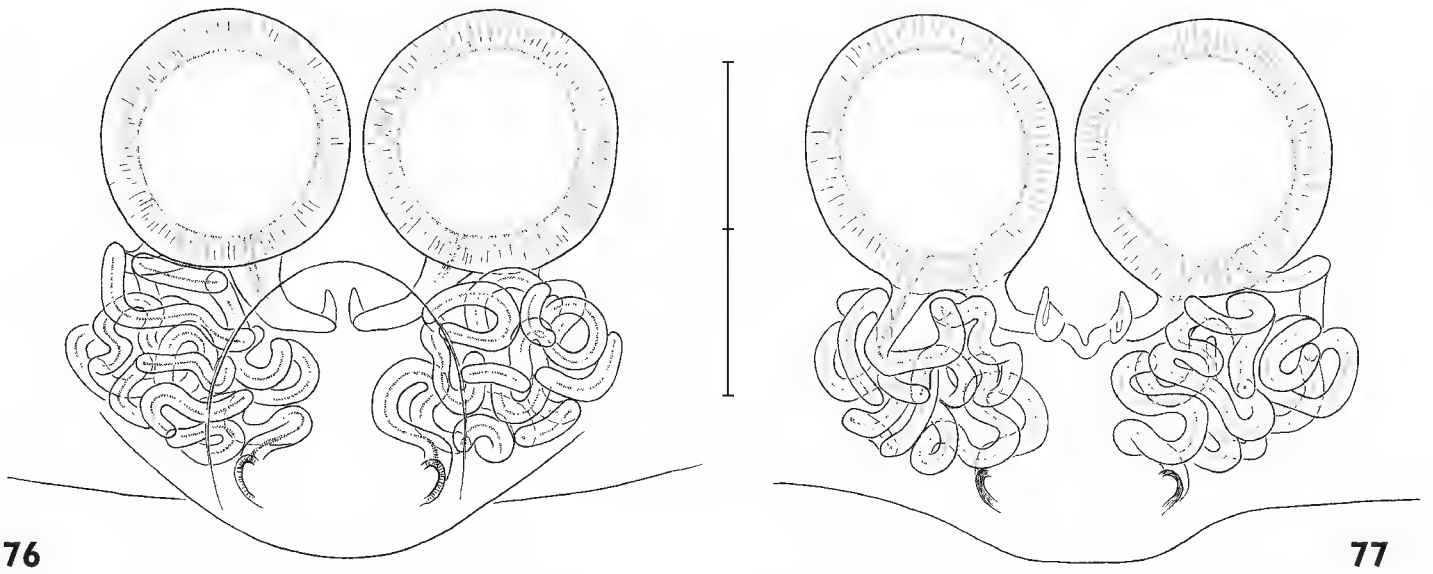
Figs 68, 76-77

Material examined. Spain: El Pardal (CM), 3 ♀ (MHNP AR 2298). **Italy:** Lombardia, Lake Lugano, Porlezza, 1 ♀ (CTh), 30.6.1962 (Thaler 1966, Abb. 2d, sub *Theridion* sp.).

Description, identification. This species has not been reported since the description of Simon (1914: 270, 297). A more detailed redescription including that of the unknown male is planned in comparison with the other members of the *Theridion melanurum* group (Knoflach, in preparation). For comparative analysis and illustration of females see Thaler (1966).

Measurements. One female from El Pardal: Total length 3.2, carapace length 1.2, width 1.1, length femur I 1.8, tibia I 1.5 mm.

Somatic features, colouration. The species is clearly a representative of the *Theridion melanurum*-group (Thaler 1966) and shares its general appearance, colour pat-



Figures 76-77. *Theridion semitinctum* Simon from Spain, El Pardal (MHNP AR 2298). Epigynum/vulva, ventral (**76**), dorsal view (**77**), drawn at same scale. Scale line: 0.20 mm.

tern and overall conformation of genital organs with *Theridion betteni*, *T. melanurum*, *T. mystaceum*, etc. Abdomen with clear folium.

Epigynum/vulva (Figs 68, 76-77). Epigynal cavity a little longer than wide, scarcely sclerotised. Copulatory orifices about 0.1 mm apart, situated at posterior inner side of cavity. Copulatory ducts extensively coiled with large overlap of coils. Receptacula seminis globular.

Distribution. Simon (1914) reported *Theridion semitinctum* from France (Provence), Spain, and the Balearic islands (Simon 1914). A further record came from northern Italy (Thaler 1966 sub *Theridion* sp.). The species has probably been confused with *T. mystaceum*.

Theridion spinitarse O.P.-Cambridge, 1876

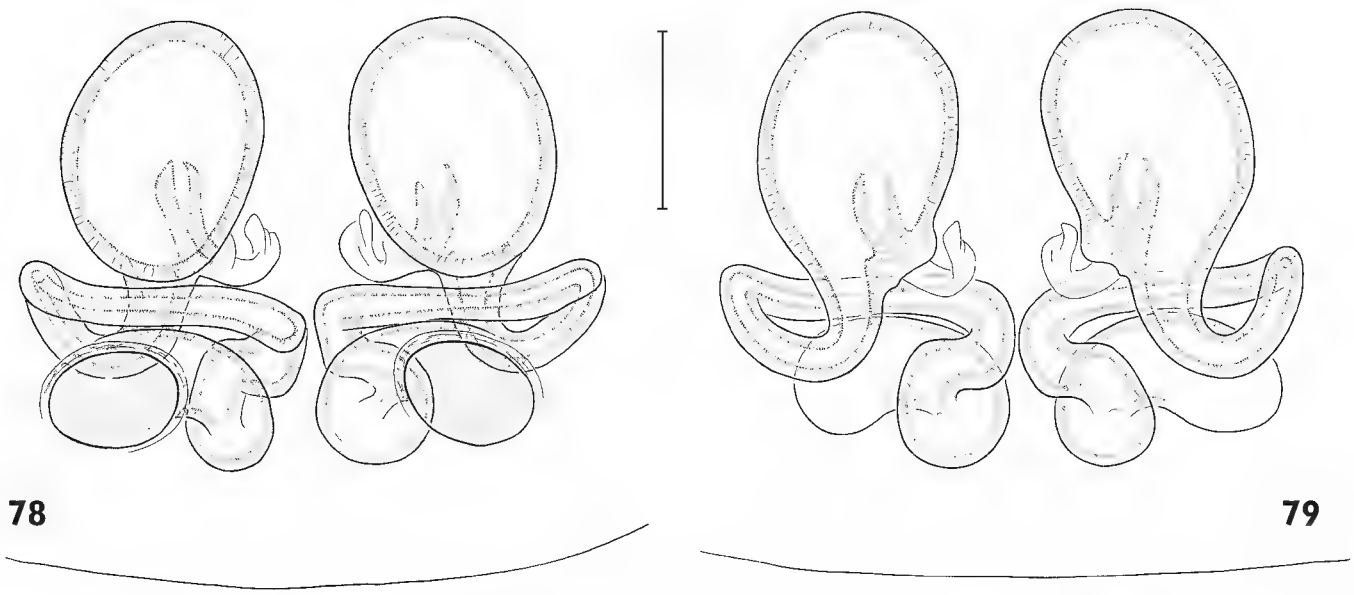
Figs 78-79

Theridion spinitarsis O. P.-Cambridge, 1876: 570, female, type locality: Cairo.
Theridion bifoveolatum Denis, 1945: 48, fig. 17, female, type locality: Luxor, Egypt, March 1923 (Levy and Amitai 1982: 84).
Non: *Theridion aelleni* Hubert, 1970: 190, figs 1-4, male, female; contra Brignoli (1984: 301), see *Theridula aelleni* below.

Material examined. Egypt: Assuan, 4 ♀ (CTh), 22.6.1975, on wall, leg. G. Kübelböck. **Saudi Arabia:** Wadi Karrar, 3 ♀ (NHMB), 10.2.1980, leg. W. Büttiker. **Yemen:** Wadi Warazan, 1 ♀, 28.10.1999, on guava, leg. M. Mahyoub and A. van Harten [794]. Al Hudaydah - Az Zaydiyah, 2 ♀, 06.12.1998, leg. van Harten [533].

Description, identification. Identification based on the description and figure given by Denis (1945 sub *T. bifoveolatum*). Male unknown.

Measurements. Females (n=5, min-max): Total length 3.4-4.2, carapace length 1.3-1.5, width 1.1-1.3, length femur I 1.7-2.0, tibia I 1.3-1.5 mm.



Figures 78-79. *Theridion spinitarse* O. P.-Cambridge. Epigynum/vulva, ventral (**78**), dorsal view (**79**), drawn at same scale. Scale line: 0.10 mm.

Somatic features, colouration. Carapace light brown, with dark margins and dark band at midline, which does not extend to eye region. Sternum of same light ground colour, sometimes with a few indistinct greyish patches or margins. Legs light brown, with dark annulations. Abdomen on dorsum with white, evenly undulated folium outlined by dark pigmentation. Epigaster light brown, venter whitish.

Epigynum/vulva (Figs 78-79). Copulatory orifices laterally oval, ca. 0.07 mm wide, 0.05 long. Orifices widely separate, about 0.2 mm apart and thus about twice their width. Their distance to epigastric furrow equals about their overall width. In mated females the orifices are filled with plug secretions. Copulatory ducts ca. 0.45 mm long, coiled dorsally and anteriorly, and form a long transverse turn laterally before bending to receptacula. Receptacula seminis large as compared with copulatory orifices, ca. 0.15 mm long, clearly visible through integument.

Affinities. The species appears to be rather close to the North American *Theridion murarium* Emerton, 1882.

Distribution. North Africa and Arabian Peninsula. *Theridion spinitarse* is so far known from several localities in Egypt (O.P.-Cambridge 1876, Denis 1945) and from Ethiopia (Pavesi 1883; Shewa, mountains around Let Marefia). It also occurs in Saudi Arabia and Yemen (present paper). It has been collected at least partially from vegetation "A single example was found on a low plant near Cairo" (O.P.-Cambridge 1876).

***Theridula aelleni* (Hubert, 1970) stat. n., comb. n.**
Figs 80-84

Theridion aelleni Hubert, 1970: 190, figs 1-4, male female, type locality: Tunisia, Gr. des Chauves-Souris, El-Haouaria, 3.10.1967. Resurrected from synonymy with *Theridion spinitarse* O. P.-Cambridge, 1876 (contra Brignoli 1984), **comb. n.**

Type material examined. Female holotype, male allotype, MHNG, Tunisia, Gr. des Chauves-Souris, El Haouaria, 3.10.1967, leg. P. Strinati, M. Frainier and V. Aellen, det. M. Hubert 1969.

Further material examined. Spain: Cadiz, Embalse de Palmones, 1 ♀ (in collection J. van Keer), 16.3.1994, leg. J. van Keer.

Description, identification. Hubert (1970).

Measurements (n=3, holotype female/ allotype male/ female from Spain): Total length 2.4/2.0/3.2, carapace length 1.0/0.9/1.1, width 0.9/0.8/1.0, length femur I 1.3/1.4/1.5, tibia I 1.2/1.3/1.2 mm.

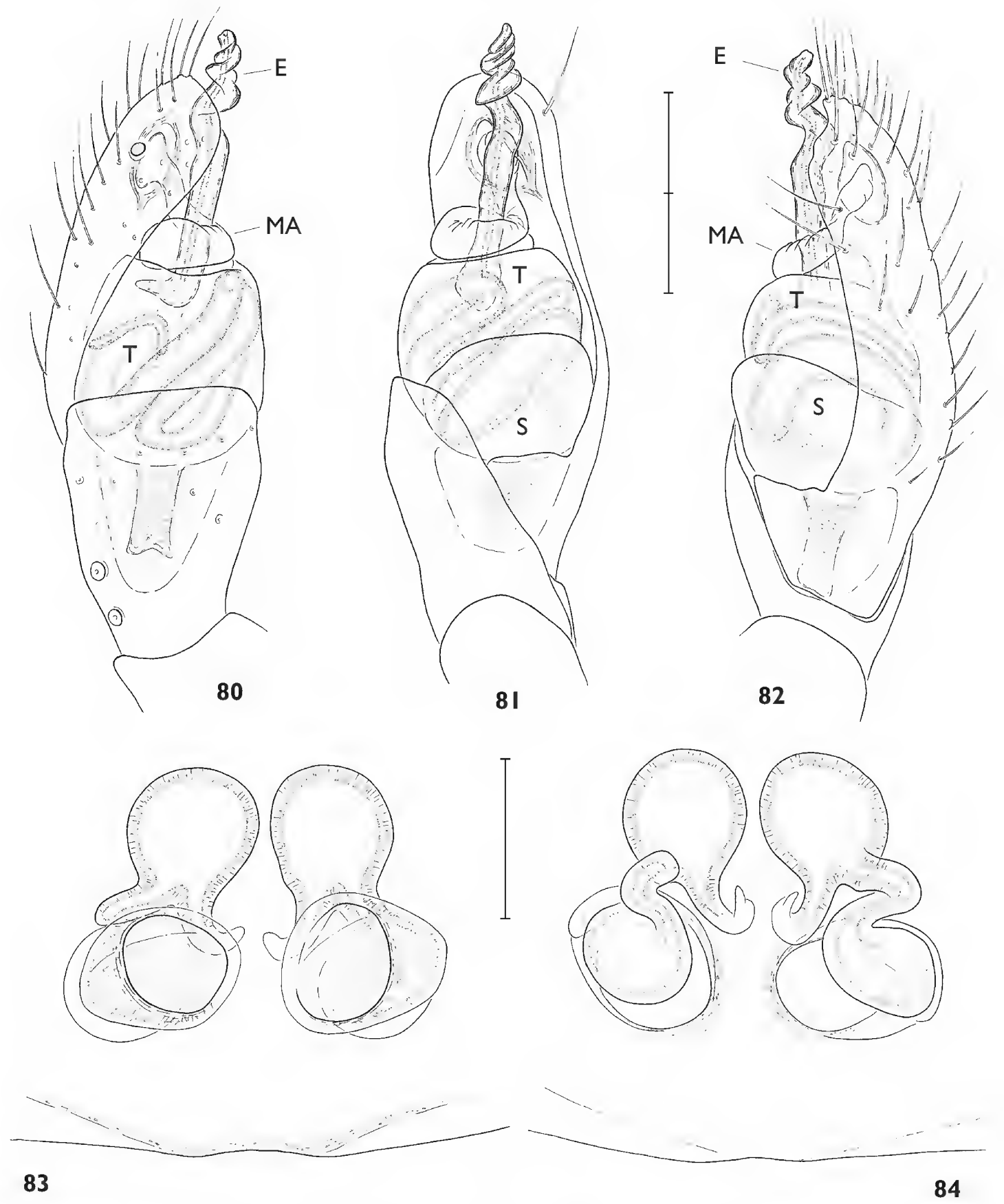
Somatic features, colouration. Specimens from Tunisia uniformly pale yellow, probably faded (but see Hubert 1970). The female from Cadiz shows an indistinct pattern: Carapace light brown with faint dusky margins and median band. Sternum dusky grey. Legs uniformly pale yellowish. Abdomen grey, with three pairs of pale transverse, oval patches, arranged in diagonal paramedian rows. Venter uniformly grey. Spinnerets contrastingly light. Male chelicerae longer than in female. Abdomen globular, a little longer than wide, without protuberances. For further details see Hubert (1970).

Male palp (Figs 80-82). Tibia rather asymmetrical, retrolaterally fairly extended (Fig. 80), but prolaterally excavated (Fig. 82), its distal rim in ventral-prolateral view oblique and almost reaching patella (Fig. 81). Two trichobothria present on retrolateral side of tibia. Cymbium elongate and slender, its base occupying prolateral side of palp, where it is markedly incised. Cymbial hood in dorsal-median position. Subtegulum and tegulum constitute the main part of genital bulb and are densely crossed by wide loops of sperm duct. The embolus forms a straight element inserted deeply within the tegulum. Subtegulum with strongly protruding sclerotised basal shaft, which is embedded within a cavity and surrounded by a noticeably developed basal haematodocha. Distal part of embolus conspicuously screwed. Embolar base encircled by a membranous apophysis, which interlocks with cymbial hood and thus is interpreted as the median apophysis.

Epigynum/vulva (Figs 83-84). Copulatory orifices roughly circular, ca. 0.6 mm wide, with marked, sclerotised outlines. They are clearly separate, but less than their diameter apart. Their distance to epigastric furrow equals about their diameter. Copulatory ducts rather short, forming a small coil, at entrance rather wide, narrowing towards receptacula. Receptacula seminis barely larger than copulatory orifices.

Taxonomic remarks, generic placement. The former synonymy of *Theridion aelleni* with *T. spinitarse* by Brignoli (1984: 301) was concluded from illustrations only and cannot be supported here. Along with the present analysis of type material the resurrection of *T. aelleni* has to be confirmed (for comparison see *Theridion spinitarse* above). However, the generic placement among *Theridion* evidently implies some difficulty. The new allocation offered here may be surprising and not fully satisfactory when considering the general appearance of hitherto known *Theridula* species, which is known to be striking, mainly through a tuberculate and wide abdominal shape, often combined with bright colour. Especially the unmodified abdomen of *T. aelleni* at first glance argues against placement within *Theridula*, but would suggest resemblance with the only hitherto known species of *Paratheridula* (see Levi 1957b). However, a transfer

of the species into *Theridula* is suggested, mainly owing to characters of the male palp: 1. Membranous median apophysis adjoining embolus and arresting towards cymbial hood (= distal haematodocha according to Levi 1954, 1966 and Levi and Levi 1962, Heimer 1982; median apophysis according to Agnarsson 2004: 596). 2. Distal part of embolus screw-shaped. 3. Asymmetry of tibia. 4. Prolateral incision of cymbium. 5. Female genitalia of concordant structure. In *Paratheridula* a median apophysis (distal



Figures 80-84. *Theridula aelleni* (Hubert) from Tunisia. Male palp, retrolateral (**80**), ventral (**81**), prolateral view (**82**). Epigynum/vulva, ventral (**83**), dorsal view (**84**). **80-82** and **83-84** drawn at same scale. Scale lines: 0.20 (**80-82**) and 0.10 mm (**83-84**).

membrane) is reported to be completely missing, which appears to be the main criterion for its separation from *Theridula* (Levi and Levi 1962).

Distribution. *Theridula aelleni* is so far known only from the type locality in Tunisia and from Spain.

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